

DEPARTMENT OF THE INTERIOR

DOMINION OF CANADA.

REPORT

OF

PROGRESS OF STREAM MEASUREMENTS

FOR

THE CALENDAR YEAR 1911

BY

F. H. PETERS, C. E.,

D. L. S., A. L. S., A. M. Can. Soc. C. E., A. M. Am. Soc. C. E.

PRINTED BY ORDER OF PARLIAMENT



OTTAWA

PRINTED BY C. H. PARMELEE, PRINTER TO THE KING'S MOST
EXCELLENT MAJESTY.

1913

CONTENTS

	PAGE
Introduction.....	7
Scope of Work.....	7
Organization.....	7
Banff district.....	8
Calgary District.....	9
Macleod district.....	9
Cardston district.....	10
Milk River district.....	11
Western Cypress Hills district.....	11
Eastern Cypress Hills district.....	12
Wood Mountain district.....	13
Moosejaw district.....	14
Battleford district.....	14
Current Meter Rating Station.....	16
Bench-marks.....	16
Office-Work.....	17
Future Work.....	17
Definitions.....	18
Explanation and use of tables.....	18
Convenient equivalents.....	19
Methods of measuring stream-flow.....	19
Methods of determining mean velocity.....	22
Gauging stations.....	23
Low-velocity limitations.....	23
Winter measurements.....	23
Re-rating of current meters.....	24
Office computations.....	24
North Saskatchewan River drainage basin.....	26
South Saskatchewan River drainage basin.....	29
Red Deer River drainage basin.....	31
Bow River drainage basin.....	36
Little Bow River drainage basin.....	91
Oldman River drainage basin.....	96
Waterton River drainage basin.....	119
Belly River drainage basin.....	120
St. Mary River drainage basin.....	122
Milk River drainage basin.....	127
Pakowki Lake drainage basin.....	149
Sage Creek drainage basin.....	151
Lodge Creek drainage basin.....	152
Battle Creek drainage basin.....	165
Frenchman River drainage basin.....	182
Swiftcurrent Creek drainage basin.....	209
Antelope Lake drainage basin.....	223
Lake of the Narrows drainage basin.....	231
Crane Lake drainage basin.....	236
Hay Lake drainage basin.....	248
Bigstick Lake drainage basin.....	253
Many Island Lake drainage basin.....	263
Ross Creek drainage basin.....	269
Sevenpersons River drainage basin.....	275
Lake Johnston drainage basin.....	276
Rocky Creek drainage basin.....	277
Poplar River drainage basin.....	278
Bigmuddy Creek drainage basin.....	279
Qu'Appelle River drainage basin.....	279
Moosejaw Creek drainage basin.....	282
Souris River drainage basin.....	289

APPENDICES

	PAGE
No. 1.—Report on the Field-work in the Wood Mountain District, during 1911, by N. M. Sutherland, District Hydrographer.....	295
No. 2.—Report on the Winter Conditions in the Banff District during the Winter of 1911-12, by V. A. Newhall, B.A.Sc., District Hydrographer.....	297
No. 3.—Description of an Apparatus for Adjusting the length of the Crest of a Steel Rectangular Weir, used by G. H. Whyte, District Hydrographer.....	298
No. 4.—Report on the Current Meter Rating Station, by F. H. Peters, C. E., Commissioner of Irrigation.....	299
Index.....	303

ILLUSTRATIONS

PLATE	TO FACE PAGE
1. Kananaskis Falls on Bow River near Kananaskis, Alta	Frontispiece
2. Pin of Permanent Iron Bench-mark	15
3. Discharge, Mean-velocity, and Area Curves of Elbow River at Calgary	22
4. Gauge-height of Top of Ice, Water Surface, and Bottom of Ice at Gauging Station on Bow River at Laggan	22
5. Discharge Curve of Milk River at Milk River	24
6. Meters and Equipment for Measuring the Discharge of a Stream by the Velocity Method	24
7. Gauging a Small Creek with a 15-inch Weir	24
8. Railway and Highway Bridge at Prince Albert Used as a Gauging Station	26
9. Traffic Bridge over the North Channel of North Saskatchewan River at Battleford	26
10. Lake Louise and Victoria Glacier Looking from Lake Louise Chalet	34
11. A Small Lake near Laggan where Nature Multiplies her Charms	34
12. Canyon on Cascade River near Bankhead, Alta.	46
13. Gauging Station on Cascade River at Bankhead, Alta.	46
14. Gauging Station on Ghost River at Gillies' Rancho in Winter	54
15. Winter Gauging of Southfork River near Cowley, Alta.	54
16. Looking East into "The Gap" on Oldman River	96
17. A Dam-site on Oldman River near "The Gap," looking Downstream	96
18. Head-gates of Alberta Railway and Irrigation Company's Canal at Kimball	124
19. Gauging Station on A. R. & I. Co. Canal at Rolph Creek Flume	124
20. Cable Support and Fastenings at Station on North Branch of Milk River at Peters' Rancho	126
21. View on Milk River near Pendant d'Oreille Police Detachment	136
22. Camp Equipment of the Hydrographer in the Western Cypress Hills district	140
23. Forest along Head-waters of Battle Creek	164
24. Lindner Brothers' Rancho near Tenmile Police Department	168
25. Wood and Anderson's Rancho	170
26. Bridge over Battle Creek at Tenmile Police Detachment	172
27. Gauging Station on Battle Creek at Nash's Rancho	178
28. White Clay from which Frenchman River gets its Local Name "Whitemud"	202
29. Enright and Strong's Dam in Frenchman River	202
30. Canadian Pacific Railway Company's Dam in Ross Creek at Irvine	270
31. Gauging Station on Ross Creek at Irvine	270
32. Bridge over Qu'Appelle River near Katepwe, Sask.	280
33. Gauging Notukeu Creek with a 15-inch Weir	280
34. Wood Mountain Party Cooking Breakfast	296
35. Wood Mountain Party Breaking Camp	296
36. Gauging Station on Bow River at Laggan in Early Fall	296
37. Gauging Station on Bow River at Laggan in Winter	296
38. Gauging Station on Pipestone River near Laggan in Early Fall	296
39. Gauging Station on Pipestone River near Laggan in Winter	296
40. Mass of Ice on Cascade River at C. P. R. Bridge	298
41. Mass of Ice on Cascade River at Traffic Bridge near Anthracite	298
42. Gauging Station on Devil's Creek near Bankhead	298
43. Gauging Cascade River on Feb. 27th, 1912	298
44. Gauging Cascade River near Bankhead in Winter	298
45. Gauging Kananaskis River near Kananaskis in Winter	298
46. Plate and Angles for Adjusting the length of the Crest of a Steel Rectangular Weir	298
47. Plate Attached to a 24-inch Weir	298
48. 24-inch Weir Reduced to 9-inch Crest in Use	298
49. 24-inch Weir Reduced to 9-inch Crest in Use	298
50. Diagram of Electric Connections at the Rating Station	300
51. View of Current-meter Rating Car Showing Trolleys and Switches	300
52. End View of Current-meter Rating Car Showing Car House behind	300
53. General View of the Current-meter Rating Car at Rest	300
54. The Current-meter Rating Car in Motion	300
55. Plan of Current Meter Rating Station	In pocket
56. Details of Car for Current-meter Rating Station	"
57. Details of Car for Current-meter Rating Station	"
58. Rating Curve for Gurley's Large Meter	"
59. Rating Curve for Gurley's Large Meter	"
60. Rating Curve for Gurley's Large Meter	"
61. Rating Curve for Gurley's Small Meter	"
62. Map Showing the Gauging Stations in Alberta and Saskatchewan	inside back cover

U. S. DEPARTMENT OF AGRICULTURE

Report of the

Commissioner of the General Land Office

for the

year ending June 30, 1904

and

for the year ending June 30, 1905

and for the year ending June 30, 1906

and for the year ending June 30, 1907

and for the year ending June 30, 1908

and for the year ending June 30, 1909

and for the year ending June 30, 1910

and for the year ending June 30, 1911

and for the year ending June 30, 1912

and for the year ending June 30, 1913

and for the year ending June 30, 1914

and for the year ending June 30, 1915

and for the year ending June 30, 1916

and for the year ending June 30, 1917

and for the year ending June 30, 1918

and for the year ending June 30, 1919

and for the year ending June 30, 1920

and for the year ending June 30, 1921

and for the year ending June 30, 1922

and for the year ending June 30, 1923

and for the year ending June 30, 1924

and for the year ending June 30, 1925

and for the year ending June 30, 1926

and for the year ending June 30, 1927

and for the year ending June 30, 1928

and for the year ending June 30, 1929

and for the year ending June 30, 1930

and for the year ending June 30, 1931

and for the year ending June 30, 1932

and for the year ending June 30, 1933

and for the year ending June 30, 1934

and for the year ending June 30, 1935

and for the year ending June 30, 1936

and for the year ending June 30, 1937

and for the year ending June 30, 1938

and for the year ending June 30, 1939

and for the year ending June 30, 1940

and for the year ending June 30, 1941

and for the year ending June 30, 1942

and for the year ending June 30, 1943

and for the year ending June 30, 1944

and for the year ending June 30, 1945

and for the year ending June 30, 1946

and for the year ending June 30, 1947

and for the year ending June 30, 1948

and for the year ending June 30, 1949

and for the year ending June 30, 1950

and for the year ending June 30, 1951

and for the year ending June 30, 1952

and for the year ending June 30, 1953

and for the year ending June 30, 1954

and for the year ending June 30, 1955

To His Royal Highness, Field Marshal, Prince Arthur William Patrick Albert, Duke of Connaught and Strathearn, K.G., K.T., etc., etc., etc., Governor General and Commander-in-Chief of the Dominion of Canada.

MAY IT PLEASE YOUR ROYAL HIGHNESS:

The undersigned has the honour to lay before Your Excellency the report of the progress of Stream Measurements for the year 1911.

Respectfully submitted,

ROBERT ROGERS,
Minister of the Interior.

OTTAWA, Sept. 16, 1912.

DEPARTMENT OF THE INTERIOR,
OTTAWA, Sept. 10, 1912.

The Honourable ROBERT ROGERS,
Minister of the Interior.

SIR:—

I have the honour to submit the report of Stream Measurements for the year 1911, and to recommend that it be published as the third of a series of progress reports.

I have the honour to be, Sir,
Your obedient servant,

W. W. CORY,
Deputy Minister of the Interior.

SESSIONAL PAPER No. 25d

FORESTRY AND IRRIGATION BRANCH,
Department of the Interior,
OTTAWA, Sept. 9, 1912.

W. W. CORY, Esq., C.M.G.,
Deputy Minister of the Interior.

SIR:—

I beg to submit herewith the progress report of Stream Measurements for the year 1911, submitted by Mr. F. H. Peters, C.E., Commissioner of Irrigation, and would recommend that it be published, and that a sufficient number of copies be printed to permit of its being widely distributed among those interested in the question of the water-supply of Western Canada.

Respectfully submitted,
R. H. CAMPBELL,
Director of Forestry and Irrigation.

DEPARTMENT OF THE INTERIOR,
IRRIGATION OFFICE,
CALGARY, ALTA, July 12, 1912.

SIR:—

I have the honour to transmit herewith the manuscript of the Report of Progress of Stream Measurements for the calendar year 1911. This Report has been prepared, under my direction, by Mr. P. M. Sauder, C.E., Chief Hydrographer. I have the honour to request that this manuscript be published as the third of the series of Reports of Progress of Stream Measurements.

I have the honour to be, Sir,
Your obedient servant,
F. H. PETERS,
Commissioner of Irrigation.

R. H. CAMPBELL, Esq.,
Director of Forestry and Irrigation,
Department of the Interior,
Ottawa.

DEPARTMENT OF THE INTERIOR,
IRRIGATION OFFICE
CALGARY, ALTA, June 29, 1912.

SIR:—

I have the honour to transmit herewith the manuscript of the Report of Progress of Stream Measurements for the Calendar Year 1911.

In this report is given a brief outline of the methods of obtaining and compiling the data contained therein, but owing to the want of space and time many of the details had to be omitted. It gives in a tabulated form almost all the records of stream-flow during 1911. As a result of certain unavoidable causes, a few of the records could not be included in this report but will be included in the next report.

I beg to request that this manuscript be published as the third of the series of Reports of Progress of Stream Measurements.

I have the honour to be, Sir,
Your obedient servant,
P. M. SAUDER,
Chief Hydrographer.

F. H. PETERS, Esq.,
Commissioner of Irrigation,
Department of the Interior,
Calgary, Alberta.

REPORT

OF

PROGRESS OF STREAM MEASUREMENTS FOR THE CALENDAR YEAR 1911.

By P. M. SAUDER, C.E., Chief Hydrographer.

INTRODUCTION.

SCOPE OF WORK

The chief features of the stream-measurement work are the collection of data relating to the flow of the surface waters and a study of the conditions affecting this flow. Information is also collected concerning the river profiles, duration and magnitude of floods, irrigation, water-power, storage, seepage, etc., which may be of use in hydrographic studies.

This information is obtained by a series of observations at regular gauging stations which are established at various points. The selection of sites for these gauging stations and their maintenance depend largely on the physical features and needs of the locality. If water is to be used for irrigation purposes the summer flow receives special attention; where it is required for power purposes, it becomes necessary to determine the minimum flow; if water is to be stored, information is obtained regarding the maximum flow. In all cases the duration of the different stages of the streams is noted. Throughout the country gauging stations are maintained for general statistical purposes, to show the conditions existing through long periods. They are also used as primary stations, and their records in connection with short series of measurements will serve as bases for estimating the flow at other points in the drainage basin.

As the result of an increased appropriation the investigations were extended over a much larger territory during the past year. Considerable reconnaissance work was done and a number of new gauging stations were established. In the spring of 1911, field operations were commenced with 98 regular gauging stations and at present the regimen of flow is being studied at 132 regular gauging stations along the various streams in Alberta and Saskatchewan; records of the quantity of water diverted by thirty ditches for irrigation purposes are also being secured. Most of the stations on ditches were established by or at the request of the irrigation inspecting engineers. Winter records which are so valuable for power investigations have been given considerable attention lately and records have been secured on almost all the important streams in the two provinces during the past winter.

ORGANIZATION

The methods of carrying on the investigations were similar to those of previous years. Local residents were engaged to observe the gauge-height at regular gauging stations. These observations were recorded in a book supplied by the Department, and at the end of each week the observer copied the week's records on a postcard which was sent to the chief hydrographer

by the first convenient mail. The district hydrographers made regular visits to the gauging stations usually once in every three weeks. They examined the observers' records, made discharge measurements and collected such information and data as would be of use in making estimates of the daily flow at the station. The results of the gaugings were transmitted by a post card to the chief hydrographer. The records of the gauge-height observers and the hydrographers were copied from the post cards to regular forms in the office at Calgary and filed. At the close of the open-water season, part of the engineers returned to the office and assisted in the final computations and estimates of run-off. Gauge-height-area, gauge-height-mean-velocity, and gauge-height-discharge curves were plotted and rating tables constructed. Tables of discharge measurements, daily gauge-height and discharge, and monthly discharge were also compiled. These records have been re-copied and are embodied in this, the third annual report of Progress of Stream Measurements.

The organization in 1911 was very similar to that of the previous years. The territory covered being very much increased during 1911, the staff was, therefore, increased to include ten assistant engineers, a recorder, a computer and a clerk. The territory was divided, for administrative purposes, into ten districts; viz., Banff, Calgary, Macleod, Cardston, Milk River, Western Cypress Hills, Eastern Cypress Hills, Wood Mountain, Moosejaw, and Battleford. In each district there was a hydrographer, and while in the field he had an assistant and was equipped with the necessary gauging and surveying instruments. In the Banff, Macleod, Moosejaw and Battleford districts the hydrographers travelled by train or by hired livery, and stopped at hotels and stopping houses, while in the other districts each was supplied with a team, light wagon and light camping outfit.

BANFF DISTRICT

This district includes the following regular gauging stations :—

Stream	Location	Date Established
Bow River.....	S. E. 28-28-16-5	July 18, 1910
“	N.E. 35-25-12-5	May 25, 1909
“	Sec. 22-25-7-4	May 25, 1910
Cascade River.....	S.E. 19-26-11-5	Aug. 16, 1911
Devil's Creek.....	S.E. 29-26-11-5	June 18, 1910
Ghost River.....	N.E. 23-26-6-5	Aug. 17, 1911
Jumpingpound Creek.....	Sec. 30-24-4-5	May 7, 1908
Kananaskis River.....	N.E. 33-24-8-5	Aug. 31, 1911
Pipestone River.....	S.W. 27-28-16-5	Aug. 31, 1911
Spray River.....	Sec. 25-25-12-5	July 15, 1910

The Bow River, with its many important tributaries, is playing a very important part in the industrial and agricultural development of Alberta. As is well known, large tracts of land lying east of Calgary and also in the vicinity of Medicine Hat are to be irrigated from it. The whole of the normal flow and a large portion of the high water have already been granted for irrigation purposes. The market for power is increasing, and preparations are being made to increase the output of the existing plants and to construct new ones. During 1911, a survey under the direction of the Water-Power Branch of the Department of the Interior made extensive investigations on the upper regions of the Bow and Elbow rivers. With a view to a very comprehensive study of the flow of these streams, several new gauging stations were established, and almost all the stations in this district have been maintained during the whole of the past winter. In a few cases the conditions have been so unfavourable that gauge-heights could not be obtained all winter, but in almost every case discharge measurements have been made regularly at intervals of about two weeks. A large number of miscellaneous measurements at other points and on other streams were also made during the year.

During the months of January, February and March, 1911, H. R. Carscallen, B.A.Sc., was in charge of the field-work in this district. On the first of April, Mr. Carscallen returned to the office and during the months of April and May, H. C. Ritchie, Grad. of S. P. S. was in charge. On the first of May, when Mr. Ritchie was placed in charge of the construction of the rating station, Benjamin Russell, B.Sc., was placed in charge. About the middle of July, Mr. Russell was transferred to reservoir site surveys and H. O. Brown was placed in charge of this district. Mr. Brown left the service in September to resume his studies at the University of Toronto, and V. A. Newhall, B.A.Sc., was in charge of the field-work in this district from that time until the end of the year. The final computations for this district were made by H. R. Carscallen.

SESSIONAL PAPER No. 25d

CALGARY DISTRICT

This district includes the following regular gauging stations:—

Stream	Location	Date Established
Berry Creek.....	N.E. 21-23-13-4	May 30, 1911
Blood Indian Creek.....	S.W. 10-23-8-4	June 26, 1911
Bow River.....	Sec. 13-21-19-4	Aug. 20, 1909
".....	N.E. 15-24-1-5	Nov. 25, 1910
C.P.R. Canal.....	N.E. 36-23-1-5	May 9, 1908
Elbow River.....	S.W. 14-24-1-5	May 8, 1908
Findlay and McDougall Ditch.....	S.W. 31-18-29-4	June 17, 1911
Fish Creek.....	S.W. 26-22-3-5	May 13, 1907
Highwood River.....	N.W. 6-19-28-4	May 28, 1908
".....	N.W. 17-20-28-4	Oct. 3, 1911
Little Bow Ditch.....	S.W. 6-19-28-4	Aug. 1, 1910
Nose Creek.....	N.W. 13-24-1-5	April 24, 1911
Pekisko Creek.....	N.W. 8-17-2-5	Oct. 6, 1911
Sheep River.....	N.W. 22-20-29-4	May 25, 1908
N.B. Sheep River.....	S.W. 12-21-3-5	May 22, 1908
S.B. Sheep River.....	S.E. 17-20-2-5	May 23, 1908
Stimson Creek.....	N.E. 14-17-2-5	Oct. 6, 1911

It will be noted that while the western portion of the old Calgary district has been formed into a separate district, a number of new gauging stations have been established and the territory extended so that this is still a large and important district. Some attention was given to a study of the flow in the tributaries of Red Deer River, but owing to the distance and difficulty of reaching these, the investigations were not as extensive as desired. The data obtained is, however, of considerable value, as previously there were practically no data at all. Regular gauging stations were established on Berry and *Blood Indian* creeks. The gauging station on Highwood River at High River is not very satisfactory, and a new station has been established near Aldersyde. If the observer at the new station proves satisfactory the old station will be abandoned. Stations have also been established on Pekisko and Stimson creeks, tributaries of Highwood River. The station on Bow River near Bassano was established and is maintained by the irrigation department of the Canadian Pacific Railway Company. Mr. A. S. Dawson, Chief Engineer, has very kindly furnished copies of the gauge-height records and the results of their gaugings. The district hydrographer also makes regular measurements at this station.

H. R. Carscallen also included Bow and Elbow rivers at Calgary in his district during the months of January, February and March. H. C. Ritchie was in charge of the field-work in the Calgary district also, during April and May, but when he was placed in charge of the construction of the rating station, L. R. Brereton was placed in charge of the field-work in this district. After he left the service in October to resume his studies at the University of Toronto, gaugings were discontinued at all the stations except those on the Bow and Elbow rivers. These were included in the Macleod district and were looked after during November and December by N. M. Sutherland. The final computations for this district were made by H. R. Carscallen.

MACLEOD DISTRICT

This district includes the following regular gauging stations:—

Stream	Location	Date Established
Belly River.....	N.W. 1-19-22-4	Aug. 31, 1911
Canyon Creek.....	N.E. 14-6-2-5	July 6, 1910
Connely Creek.....	S.E. 36-7-2-5	July 31, 1909
Cow Creek.....	N.E. 14-8-2-5	May 26, 1910
Crowsnest River.....	N.E. 26-7-2-5	Sept. 7, 1907
do.....	N.E. 36-7-4-5	July 28, 1910
do.....	S.W. 12-8-5-5	July 28, 1910
Mill Creek.....	S.W. 18-6-1-5	July 7, 1910
Mosquito Creek.....	N.E. 30-16-28-4	Aug. 1, 1908
Muddypound Creek.....	Sec 27-11-28-4	July 27, 1908
Nanton Creek.....	Sec. 20-16-28-4	Aug. 3, 1908
Oldman River.....	N.E. 34-7-1-5	Sept. 15, 1908
do.....	N.W. 10-9-26-4	July 12, 1910
Pincher Creek.....	N.E. 22-6-30-4	Aug. 13, 1906
Southfork River.....	S.E. 2-7-1-5	Aug. 5, 1909
St. Mary River.....	N.E. 26-7-22-4	Oct. 13, 1911
Todd Creek.....	S.W. 19-8-1-5	Aug. 3, 1909
Trout Creek.....	Sec. 33-11-28-4	July 7, 1911
Willow Creek.....	S.W. 25-9-26-4	July 1, 1909

This district was well organised soon after the survey was commenced, and few changes were made and few stations established during the past year. The new stations on Belly and St. Mary rivers will furnish valuable data. The importance of St. Mary River as a source of water-supply for irrigation purposes and its possibilities as a source of power are well known, and the records at the new station will serve to make the data more complete. The discharge of Belly River near Lethbridge is the drainage of practically the whole of the south-western portion of the province of Alberta, and records at this point will be very valuable for general statistical purposes, and in connection with short series of measurements will serve as basis for estimating the flow at other points in the drainage basin. The conditions at the old station on Oldman river near Macleod have very much improved and last year this station was re-established. For some time the Branch was unable to secure an observer at a suitable site on Trout Creek above the intakes of the ditches, but last year one was secured and a new station was established, and the old one abandoned.

Gauge-height observations and discharge measurements have been taken at all the regular gauging stations on all the larger and more important streams throughout the past winter. A large number of miscellaneous discharge measurements, which will be very valuable as general information, were also made during the year.

Owing to the coal-miners' strike, industrial development in the Crowsnest district was slightly retarded during 1911. The water-supply is, however, becoming more important, and, while there is no necessity for establishing any additional gauging stations, there should be no interruption in the records at those already established.

W. H. Greene, Grad. of S. P. S., was in charge of the field-work in this district until the middle of March when he was transferred to the Battleford district. J. E. Degnan was then in charge until the end of April when he was transferred to the Milk River district. A. W. P. Lowrie, Grad. of S. P. S., was in charge from the first of May to the end of September, when he returned to the University of Toronto to resume his studies. N. M. Sutherland, Grad. of the Royal Military College, has been in charge since Mr. Lowrie left. Only part of the final computations for this district have been made. These were made by H. J. Duffield, C.E., and G. H. Whyte.

CARDSTON DISTRICT

This district includes the following regular gauging stations:—

Stream	Location	Date Established
A. R. & I. Canal.....	S. W. 21-2-24-4	July 26, 1910
Belly River.....	S.E. 21-6-25-4	May 27, 1909
do	N.E. 5-2-28-4	Nov. 1, 1911
Christianson Ditch.....	S.E. 12-3-28-4	Sept. 14, 1911
Crooked Creek.....	S.E. 23-2-29-4	Sept. 15, 1909
Fidler Ditch.....	S.E. 19-1-26-4	Sept. 13, 1911
Lee Creek.....	N.W. 10-3-25-4	June 28, 1909
Mami Creek.....	N.E. 18-2-27-4	Aug. 13, 1909
N.B. Milk River.....	N.E. 13-1-23-4	July 21, 1909
do	Sec. 18-2-20-4	July 17, 1909
Ralph Creek.....	S.W. 21-2-24-4	May 17, 1911
St. Mary River.....	Sec. 25-1-25-4	By. A.R. & I Co., 1905
Waterton River.....	N.E. 8-2-29-4	Aug. 26, 1908

While a station has been maintained on Belly River near Stand Off for some time, the importance of this stream as a possible supplementary supply for the A. R. & I. Canal justified the survey in establishing another station in the vicinity of Mountain View. A cable station was, therefore, established on the N. E. $\frac{1}{4}$ Sec. 5, Tp. 2, Rge. 28, W. 4th Mer., at West's ranche, last fall, and has been included in this district.

It was impossible to secure an observer for the gauge on the North Branch of Milk River in Sec. 18, Tp. 2, Rge. 20, W. 4th Mer., during 1911, but discharge measurements were made at every opportunity.

For several years past the Water Resources branch of the U. S. Geological Survey has maintained a gauging station on St. Mary River near the International Boundary. The gauging station at Kimball is only a few miles below, and it is thought that a joint station should be maintained. A self-recording water-gauge could be installed, and by making comparisons of the results of the gaugings made by the hydrographers of both countries, records of a high degree of accuracy and results which would be most satisfactory to both countries could be obtained. It is hoped that satisfactory arrangements can be made and a joint station established in the near future.

There are several streams of some importance emptying into the Waterton lakes, but as no observers are available, regular gauging stations have not been established on these. Mis-

SESSIONAL PAPER No. 25d

cellaneous discharge measurements of these and several other streams in the district were made whenever possible during the past year.

Winter records were taken at the stations on Belly River, Lee Creek, St. Mary River and Waterton River.

L. J. Gleeson, B.Sc., was in charge of the field-work in this district until the end of November, when he returned to the office to make the final computations, and D. D. Macleod, B.A.Sc., was in charge of the field-work during the winter months.

There are only a few irrigation ditches in this district and the hydrographer, therefore, makes the necessary inspections. Unless urgent, these are usually made in the late summer or early fall, when the streams are low and almost stationary and need not be gauged as often as usual.

MILK RIVER DISTRICT

This district includes the following regular gauging stations:—

Stream	Location	Date Established
Deer Creek.....	S.W. 15-1-12-4	May 26, 1911
do	N.E. 26-1-12-4	May 27, 1911
Manyberries Creek.....	S. E.3-5-6-4	June 17, 1910
Milk River.....	N.E. 21-2-16-4	May 18, 1909
do	S.W. 35-1-13-4	Aug. 2, 1909
do	S.W. 21-2-8-4	Aug. 5, 1909
do	S.E. 3-1-5-4	Aug. 7, 1909
N.B. Milk River.....	S.W. 19-2-18-4	July 15, 1909
S.B. do	N.W. 31-1-18-4	July 14, 1909

It was impossible to secure an observer for the gauge on the North Branch of Milk River on the S. W. $\frac{1}{4}$ Sec. 19, Tp. 2, Rge. 18, W. 4th Mer., during 1911, but discharge measurements were made at every opportunity.

As has been pointed out in former reports, the bed of Milk River is composed almost entirely of sand and loose material, which shifts continually. Discharge measurements had, therefore, to be made at short intervals and even then considerable difficulty was experienced in compiling reliable estimates of the daily discharge.

As there have been several applications for water for irrigation purposes in the vicinity of Pakowki Lake, special attention was given to the records on Manyberries Creek. Not only will these be useful in studying the water-supply in this stream, but by comparing the areas of the watersheds, a fair estimate can be made of the probable run-off in other streams in the Pakowki Lake drainage.

It will be noted that two gauging stations have been established on Deer Creek. This is only a small stream, but a dispute has arisen between two licensees and data are recorded at the two points to determine the seepage. As these stations are close to the regular route of the hydrographer little time is lost in making the gaugings and the results are of general interest.

A large number of miscellaneous discharge measurements of the small streams draining into Milk River were made during the year.

In this district also the hydrographer makes inspections of and reports on the irrigation works.

N. M. Sutherland was in charge of the field-work in this district during the month of April, but for the remainder of the open season J. E. Degnan was in charge. Winter measurements were made during the past winter at the regular station on the N. E. $\frac{1}{4}$ Sec. 21, Tp. 2, Rge. 16, W. 4th Mer., by D. D. Macleod. The final computations for this district were made by J. E. Degnan.

WESTERN CYPRESS HILLS DISTRICT.

This district includes the following regular gauging stations:—

Stream	Location	Date Established
Anderson Ditch.....	S.W. 23-6-3-4	Sept. 23, 1911
Battle Creek.....	S.W. 2-6-28-3	July 5, 1910
do	N.E. 33-5-29-3	June 3, 1909
do	N.E. 3-3-27-3	May 10, 1910
Bullshead Creek.....	N.W. 15-9-5-4	Oct. 9, 1911
Cheeseman Ditch.....	S.W. 12-8-29-3	June 24, 1911
Gaff Ditch.....	Sec. 25-5-29-3	July 11, 1911
Gap Creek.....	N.E. 31-11-26-3	May 3, 1910
"	S.W. 3-10-27-3	Apr. 25, 1909

Gilchrist Bros. Ditch.....	S.W. 11-5-27-3	Oct. 16, 1911
Grosventre Creek.....	S.E. 27-9-4-4	Oct. 10, 1911
Lindner Ditch.....	Sec. 10-6-29-3	July 26, 1910
Lodge Creek.....	Sec. 12-1-29-3	Aug. 13, 1909
do	S.W. 15-6-3-4	July 22, 1909
E.B. Lodge Creek.....	S.E. 1-7-3-4	Oct. 7, 1911
E.B. Mackay Creek.....	N.W. 36-10-1-4	Oct. 13, 1911
W.B. Mackay Creek.....	S.W. 23-10-2-4	Oct. 12, 1911
McShane Creek.....	Sec. 4-10-27-3	Apr. 23, 1909
McKinnon Ditch.....	N.W. 20-4-26-3	Oct. 20, 1911
Maple Creek.....	N.E. 16-11-26-3	May 9, 1908
do	S.E. 28-11-26-3	May 4, 1910
Marshall Ditch.....	N.E. 33-5-29-3	July 11, 1911
Marshall and Gaff Ditch.....	S.W. 25-5-29-3	July 11, 1911
Middle Creek.....	S.W. 35-5-1-4	June 21, 1910
do	S.W. 30-5-29-3	July 20, 1909
do	N.E. 4-2-29-3	June 13, 1910
Oxarart Creek.....	N.E. 20-6-27-3	June 15, 1909
Richardson Ditch.....	S.E. 2-5-27-3	Oct. 14, 1911
Ross Ditch.....	N.W. 24-9-3-4	Oct. 11, 1911
Sage Creek.....	Sec. 9-1-2-4	Aug. 10, 1909
Sixmile Coulee.....	N.W. 36-6-29-3	July 4, 1911
do	N.W. 29-7-28-3	July 22, 1909
Spangler Ditch.....	Sec. 6-7-28-3	July 10, 1911
Starks and Burton Ditch.....	S.E. 17-11-5-4	Oct. 9, 1911
Stirling and Nash Ditch.....	Sec. 22-3-27-3	July 11, 1911
Tenmile Creek.....	S.W. 4-6-29-3	July 21, 1909
White Ditch.....	S. W. 1-9-27-3	June 15, 1911

The majority of applications for water for irrigation purposes during the past years have come from the Cypress Hills, and, as apparently almost the total flow of many of the streams has already been granted, the records in this district are very important. It is impossible to obtain records on every stream in the district, but stations have been established and are maintained on all the more important streams and by a careful comparison of watersheds fair estimates of the probable flow can now be made for many of the smaller and less important streams for the same year. There are, however, very big differences in the run-off for different years, and it will be some years before the records will show the extremes of flow and a reliable mean.

During the past year, M. H. French, who was in charge of the field-work in this district, made a reconnaissance of the country surrounding Old Fort Walsh and the heads of Battle, Lodge, Mackay, Ross and Bullshead creeks and established several new stations. W. A. Fletcher, irrigation inspector, established the gauging stations on most of the irrigation ditches in this district, but, as some of the ditches were not used during 1911 and in other cases the gauge was not installed until after the irrigation season, few records of the flow in the ditches have been secured.

A heavy rain and snow storm in September caused an unexpected flood in many of the streams in this district, and the run-off during the fall was higher than the average.

A large number of miscellaneous gaugings which will be valuable as general information were made in this district during 1911. No winter records were taken.

M. H. French was in charge of the field-work and also made the final computations.

EASTERN CYPRESS HILLS DISTRICT

This district includes the following regular gauging stations:—

Stream	Location	Date Established
Axton Ditch.....	N.E. 23-7-21-3	Aug. 12, 1911
Bear Creek.....	S.E. 18-11-23-3	June 22, 1908
E. B. Bear Creek.....	S.E. 21-10-23-3	Aug. 18, 1909
W. B. Bear Creek.....	S.W. 32-10-23-3	Sept. 16, 1909
Belanger Creek.....	S.W. 18-7-25-3	June 12, 1909
Beveridge Ditch, West Branch.....	N.W. 18-10-24-3	June 5, 1911
do East Branch.....	N.E. 7-10-24-3	June 9, 1911
Blacktail Creek.....	S.W. 31-6-23-3	Aug. 3, 1909
Bone Creek.....	N.W. 34-8-22-3	July 2, 1908
Braniff Ditch.....	S.E. 30-11-23-3	July 22, 1911
Bridge Creek.....	N.W. 11-11-22-3	July 29, 1909
do	S.E. 33-10-22-3	Apr. 29, 1911
Cross Ditch.....	N.W. 15-7-22-3	Sept. 9, 1911
Davis Creek.....	N.E. 29-6-25-3	May 24, 1909

SESSIONAL PAPER No. 25d

Enright and Strong Ditch.....	N.E. 25-6-22-3	July ^o 31, 1908
Fairwell Creek.....	N.W. 30-6-24-3	June 10, 1909
Fearon and Moorehead Ditch.....	N.E. 29-10-22-3	July 6, 1911
do do	N.E. 33-10-22-3	July 4, 1911
do do	S.E. 33-10-22-3	July 6, 1911
N.B. Frenchman River.....	N.E. 16-7-22-3	July 25, 1908
Frenchman River.....	N.E. 31-6-21-3	July 31, 1908
Hay Creek.....	N.E. 30-10-25-3	April 22, 1909
do	S.W. 29-10-25-3	July 4, 1910
Jones Coulee.....	N.E. 5-8-10-3	Sept. 23, 1909
Lonepine Creek.....	N.W. 27-7-26-3	July 17, 1909
Moorehead Ditch.....	N.W. 25-10-25-3	June 10, 1911
Morrison Ditch.....	S.W. 26-6-21-3	Aug. 22, 1911
Needham Ditch.....	S.W. 30-11-23-3	June 22, 1911
Piapot Creek.....	N.E. 18-11-24-3	June 17, 1908
Pollock Ditch.....	N.W. 22-7-21-3	Aug. 10, 1911
Rose Creek.....	Sec. 26-7-22-3	May 2, 1911
Skull Creek.....	N.W. 10-11-22-3	June 29, 1908
do	N.E. 29-10-22-3	April 8, 1911
Sucker Creek.....	N.W. 24-6-26-3	May 26, 1909
Swiftcurrent Creek.....	S.W. 22-7-21-3	May 18, 1909
do do	Sec. 17-10-19-3	May 27, 1910
do do	Sec. 18-10-19-3	June 15, 1910

The remarks regarding the conditions in the Western Cypress Hills district apply also to this district. The greatest irrigation development has been in the Frenchman River drainage basin, and special efforts are being made to get gaugings in this locality during high-water and flood stages of the streams. This, however, is a large district with many long drives, and it is impossible always to be on hand at a particular station when the stream is high. There has also been difficulty in securing good observers. The records have, however, improved considerably during the past year.

Several gauges were installed on irrigation ditches by F. T. Fletcher, irrigation inspector, but, as some of the ditches in this district were not used during 1911, and most of the gauges were not installed until after the irrigation season, few records of the flow have been secured.

As a large quantity of water is diverted from Frenchman River above the old gauging station, the records have not been altogether satisfactory. It was, therefore, decided to establish two cable stations at points above East End. The cables were stretched late last fall, but owing to bad weather the hydrographer was unable to finish these stations. They will be completed and put in good shape this spring, and it is expected that better and more satisfactory records will be obtained. The records on Bridge and Skull creeks have been much improved by the additional data secured at the new stations above the intakes of Fearon and Moorehead's ditches. A gauge was placed on Mule creek, but, as a satisfactory observer could not be secured, no records except periodic discharge measurements were secured.

The storm in September also raised the streams in this district, but not as much as in the Western Cypress Hills district.

A large number of miscellaneous gaugings which will be valuable as general information were made in this district during 1911. No winter records were taken.

G. H. Whyte was in charge of the field-work and also made the final computations.

WOOD MOUNTAIN DISTRICT

There is only one regular gauging station in this district, namely:—

Stream	Location	Date Established
Frenchman River.....	Sec. 5-5-14-3	May 23, 1910

During 1911, a study was made of the water-supply and possibilities of irrigation development in a large and partially settled district in the southern part of Saskatchewan, including the drainage basins of Lake Chaplin, Lake Johnston, Big Muddy Lake, Poplar Creek, Rocky Creek and the lower part of Frenchman River. Early in June, N.M. Sutherland and the Chief Hydrographer left Swift Current and made a circuit of the western portion of this district. Mr. Sauder returned to Calgary at the end of June, and the investigations were continued by Mr. Sutherland.

An account of the work done in this district is given in a separate report by Mr. Sutherland. For this work Mr. Sutherland was provided with a light camping outfit, one man and three horses. He travelled about 1,660 miles and reported 109 gaugings. While many of the reports showed that the streams were dry or nearly dry, or that water was standing in pools, it should be remembered that a trip had to be made to the stream to learn the condition. Reports on streams, even when dry, are just as important as when they are running, as they show the actual conditions of the stream at that time.

As a result of the investigations during 1911, it has been decided that the possibilities of irrigation in this district are so limited that there will be no necessity to carry on any further reconnaissance on stream-measurement work for the present.

As suggested by Mr. Sutherland, in a few years the farmers in this locality may wish to use the water from springs for irrigation purposes, and, when such occasions arise, no doubt investigations will have to be made of the schemes.

The records of flow for the regular station on Frenchman River were not very satisfactory. At first an observer could not be secured, and then beavers built a dam below the gauge and caused the water to back up on it. As these difficulties still exist and there will be no hydrographer in the district during 1912, it has been decided to abandon this station.

MOOSEJAW DISTRICT

This district includes the following regular gauging stations.

Stream	Location	Date Established
Boxelder Creek.....	N.E. 2-12-30-3	May 24, 1909
Bridge Creek.....	S.E. 23-13-19-3	Mar. 29, 1911
Bullshead Creek.....	Sec. 16-12-5-4	July 26, 1909
Long Creek.....	S.E. 10-2-8-2	June 22, 1911
Mackay Creek.....	N.W. 26-11-1-4	July 29, 1909
Moosejaw Creek.....	N.W. 14-15-25-2	April 13, 1910
do do	N.W. 16-16-26-2	April 7, 1910
do do	N.W. 19-11-18-2	June 21, 1911
Qu'Appelle River.....	S.W. 33-19-21-2	May 12, 1911
Ross Creek.....	N.W. 31-11-2-4	July 28, 1909
S. Saskatchewan River.....	N.W. 31-12-5-4	May 31, 1911
Sevenpersons River.....	N.E. 30-12-5-4	April 27, 1910
Souris River.....	N.E. 11-2-8-2	June 23, 1911
do	N.E. 36-2-1-2	June 26, 1911
do	Sec. 6-4-26-1	July 20, 1911
Swiftcurrent Creek.....	S.W. 30-15-13-3	April 30, 1910

It is imperative that records should be continued on Moosejaw Creek for several years, and, as there are a number of important streams crossing and in the vicinity of the railway between Medicine Hat and Broadview, and between Moosejaw and Melita, it was decided to have a hydrographer look after these by train.

Some time was spent in reconnaissance to find the most suitable sites before the new stations were established. Besides those shown above, stations were established on Qu'Appelle River at points north of the towns of Qu'Appelle and Indian Head, but the current was so sluggish at these two points that the records were not satisfactory and the stations have been abandoned.

J. C. Keith, B.A.Sc., was in charge of the field-work in this district. After the stations had been established he did not retain a regular helper but engaged locally any help he required. Mr. Keith made a number of miscellaneous gaugings and inspected several works to divert water for domestic and industrial purposes.

Winter records were taken at the stations on Moosejaw Creek near Moosejaw and Qu'Appelle River at Lumsden during the past winter. They were included in the Battleford district during that period.

Final computations for this district were made by M. H. French and G. H. Whyte.

BATTLEFORD DISTRICT

This district includes the following regular gauging stations:—

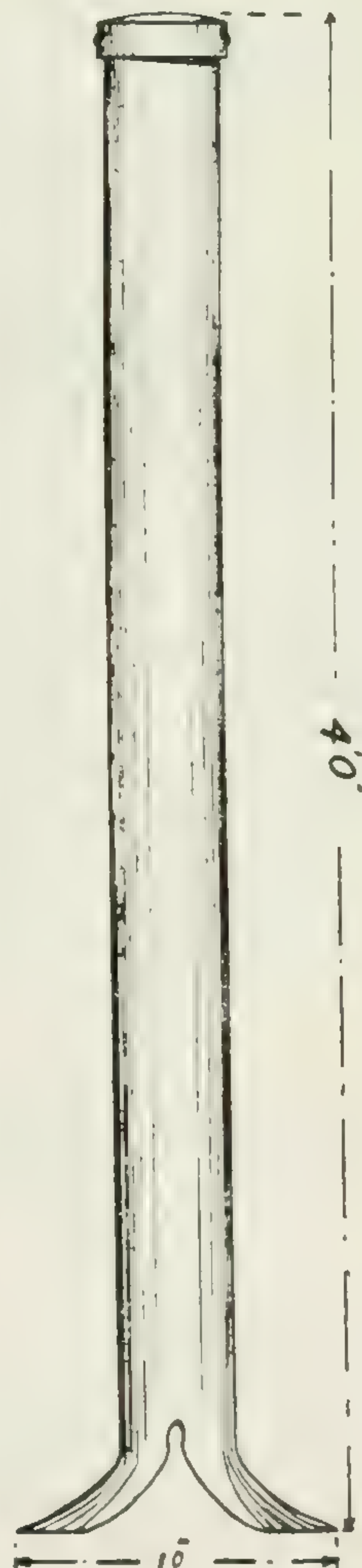
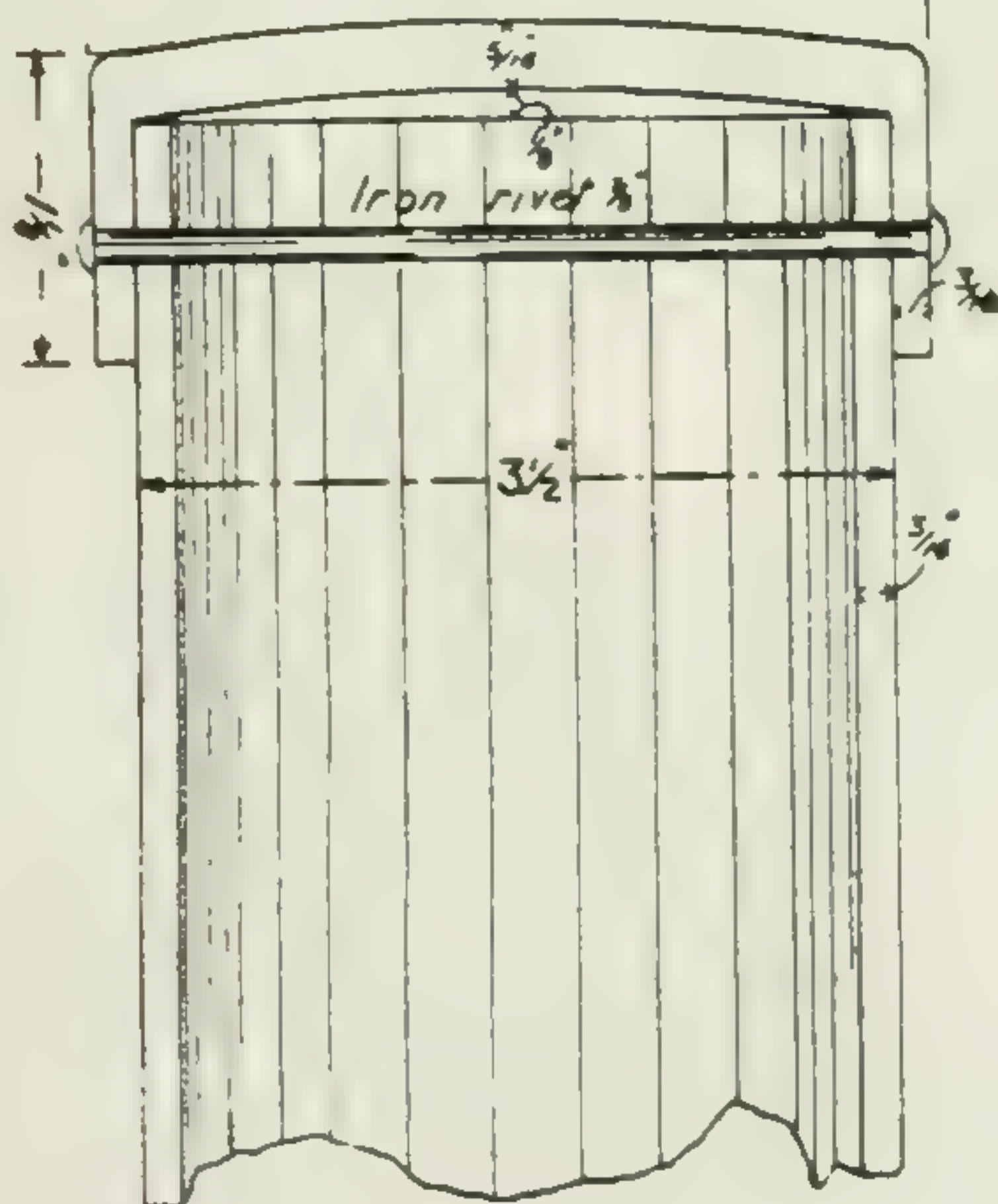
Stream	Location	Date Established
Battle River.....	S.E. 19-43-16-3	June 17, 1911
Red Deer River.....	S.E. 20-38-27-4	Dec. 2, 1911
N. Saskatchewan River.....	N.W. 33-52-24-4	May 14, 1911
do	N.E. 29-43-16-3	May 18, 1911
do	River lot No. 76	Oct. 2, 1911
S. Saskatchewan River.....	S.W. 28-36-5-3	May 27, 1911

While the North and South Saskatchewan rivers are not likely to be of importance for irrigation purposes, they are large streams and may be utilized for power and irrigation purposes. The watersheds are large, and records on these streams will also be of considerable value for general statistical purposes.

DEPT. OF THE INTERIOR
IRRIGATION OFFICE
PLAN
OF
PERMANENT IRON BENCH MARK



Half Size



Investigations in this district were commenced in March, 1911, when miscellaneous gaugings were made on the North Saskatchewan River at Edmonton and Battleford by W. H. Greene.

In May, H. R. Carscallen was placed in charge of this district, and at once established stations at Edmonton, Battleford and Saskatoon. Later a station was established at Prince Albert by J. C. Keith.

In 1910, Mr. Keith reconnoitered Red Deer River in the vicinity of Red Deer and found that the most suitable site for a regular gauging station was at a traffic bridge west of Innisfail. Arrangements were made for an observer, but he failed to perform the duty. Gaugings were made at regular intervals at this station during 1911, but no gauge-height observations were secured. In November, a further reconnaissance was made, and, as the cross-section has improved and conditions are now fairly good, a station was established at the traffic bridge in the town of Red Deer.

Mr. Carscallen had charge of the field-work in this district until the end of July, when he received leave of absence. After that Mr. Keith included this district in his route. Gaugings were continued during the winter at all the stations except the one on Battle River. Different members of the staff have done parts of the final computations for this district, but they are only partly finished.

On account of the distance between the stations the travelling and living expenses of the hydrographer are somewhat higher than in the other districts. For several months the hydrographer worked without a regular helper and hired locally what help he required, but, as the rivers in this district are very large, much skill is required in making accurate measurements, particularly the soundings, and so much time was lost with an inexperienced helper that it was decided that the hydrographer should have a regular helper.

CURRENT-METER RATING STATION

In 1911, a new and up-to-date current-meter rating station was established at Calgary. The plans, specifications and estimate of cost for the station and equipment were prepared by the Commissioner of Irrigation, and the construction was also carried out under his personal direction. Particulars of the station and a discussion of the methods employed in and the results of ratings are republished from the general report on Irrigation and Canadian Irrigation Surveys as an appendix to this report.

H. C. Ritchie acted as resident engineer on the construction of the rating station. On the completion of this, he was transferred to the National Parks branch of the Department of the Interior, and V. A. Newhall was detailed to rate the meters.

All the meters of the survey except four which were not used during 1911 and one which was badly damaged were rated and tables were carefully compiled for each. Three meters belonging to the British Columbia Railway Belt Hydrographic Survey and one belonging to the Irrigation Department of the Canadian Pacific Railway were also rated. A number of meters were re-rated just before freeze-up in the fall and all the hydrographers are provided with newly rated meters when they start out in 1912. The spare meters will be rated as soon as possible, and whenever a hydrographer has reason to believe that the rating of his meter has changed, a newly rated meter will be sent out to him and he will return the old meter. Every meter which is in use will be rated at regular intervals to test it. In future a hydrographer will be retained at headquarters to rate meters, look after the taking of gravel from Bow and Elbow rivers within the limits of the city of Calgary, and do any special hydrographic work that may arise.

BENCH-MARKS

In previous years when regular gauging stations were established, the gauge was usually referred to a bench-mark on a wooden stake or the stump of a tree. These were easily shifted or destroyed, and were not satisfactory. During 1911, permanent iron bench-marks were established at 62 regular gauging stations. Except where the gauge can be referred to a bench-mark on a concrete pier or other permanent structure, all the new gauges (and as soon as possible all the old gauges) will be referred to permanent iron bench-marks. An assumed elevation has been given to each bench-mark, but it is expected that the actual elevation above mean sea-level will eventually be determined.

Plate No. 2 shows the type and details of the permanent iron bench-mark which is used. This is the type of bench-mark that has been adopted by the United States Geological Survey, and over 20,000 bench-marks of this type have been used in the United States.

It is made of a piece of three and a half inch wrought-iron pipe, which is split at the bottom and expanded to a width of ten inches in order to anchor the tube solidly in the ground. The top is covered by a cap, cast out of brass or, preferably, aluminum bronze (10 per cent aluminum and 90 per cent copper), which is secured to the top of the pipe by a long iron rivet. All the writing on the cap is cast in sunk-in letters, giving a smooth surface to the cap. All the exposed surfaces of the iron pipe are given a good coat of a first-quality rust-resisting paint, and the bench-mark is set with six inches projecting above the ground.

When extensive levelling operations are commenced it will be necessary to have some form of bench-mark which can be set in solid rock or solid masonry. For such places the brass cap

SESSIONAL PAPER No. 25d

for the iron bench-mark would be modified and have a stem about three inches long projecting on the under side, which would be cemented into a drill hole in the rock or masonry.

OFFICE-WORK

As above intimated, the reports of the gauge-height observers and the hydrographers are transmitted to the office by post-cards. These are copied to office forms and filed in a cabinet, which is carefully indexed and where they can be referred to at any time without trouble. As the engineers completed their computations the results were entered on convenient forms and filed in the same cabinet.

A cabinet made up of four styles of drawers is used for filing the records. The top section is used for filing the gauge-height books of the observers and the current-meter note-books of the hydrographer. The gauge-height books are filed alphabetically according to the names of the gauging stations, while the current-meter note-books are filed alphabetically according to the names of the hydrographers. The next section contains the post cards sent in by the observers and the hydrographers. Both of these are filed alphabetically according to the names of the gauging stations. The third section is made up of map drawers and contains the gauge-height-area, gauge-height-mean-velocity and gauge-height-discharge curves and plotted cross-sections, which are filed alphabetically according to the names of the gauging stations. The same section contains the maps showing the outline of the drainage basins, filed numerically according to the number of the sectional sheet. The rating curves for the current-meters are also filed in this section, numerically according to the office numbers of the meters. The bottom section of the cabinet consists of letter-size pockets, alphabetically arranged for each gauging station. The tables of gauge-heights, discharge measurements, daily gauge-height and discharge, monthly discharge and a description of the station and memos of any changes are filed in these pockets. The different rating tables for each meter are also filed numerically in this section and another drawer contains the monthly reports of the meteorological service.

The copying and filing of the reports of the gauge-height observers and the hydrographers is entrusted to the office recorder. While doing this, he must carefully examine all records to see that there are no errors or mistakes, and where there are doubtful or impossible records it is his duty to have the data corrected or ascertain the cause of the unusual condition. He also makes out the pay list for the observers and conducts the correspondence relating to the records.

There was no regular recorder until about the end of July, when R. H. Goodchild was engaged. He is to be placed on irrigation inspections, and G. H. Nettleton will be placed in charge of the records.

All computations made by the survey are checked before being used or published. For this reason, as far as possible, men with some technical education or students in science are engaged as helpers. The gaugings are computed by the helper, and his work is checked by the hydrographer. In some instances, where there is a great deal of driving and camping out, the hydrographer cannot secure a helper who can compute discharges, and, in that case, he computes the discharges himself and his computations are checked in the office. Gaugings of the flow under ice are usually made by using the multiple-point method and vertical-velocity curve have to be plotted to determine the mean velocity in the vertical. The computation by this method is long and tedious and cannot be done by the hydrographer in the field. There are therefore, a great many computations to be made in the office and the services of a computer have been required. As a result of not having one, a large amount of checking and computing had to be done by the hydrographers after they returned to the office, and for that reason the computation of daily discharge for 1911 had not been all completed when spring arrived and the hydrographers had to leave for the field. Those that are unfinished are mostly for the months of November and December, when ice conditions prevailed, and considerable time has to be spent in computing the discharge. During the winter months R. J. Srigley, one of the helpers, was utilized as a computer. He is, however, going out in the field again as a helper, and a computer is urgently required.

FUTURE WORK

Investigations will be continued during the coming year in all the old districts except Wood Mountain, and every effort will be made to extend the territory covered by the survey, but the scope of the work is of course limited by the appropriations and staff available.

There are a number of important streams which rise in the mountains west of the Calgary and Edmonton branch of the Canadian Pacific Railway. With the advent of railways, industries will soon be started in this district and the water-supply will be an important factor. A small party, such as operated in Wood Mountain district during 1911, should be placed in this district in the near future.

An effort will be made during the coming year to collect data regarding the flow in the streams along the Grand Trunk Pacific Railway west of Edmonton. As soon as funds and staff are available, the survey should be extended to include the Athabaska River drainage basin.

It is not necessary to elaborate on the importance of continuing observations during the winter on the more important streams. The minimum flow occurs during that season and should be determined for use in considering power schemes. While it was realized that the streams got very low during the winter, the results of the investigations in many cases show much lower discharge than was expected. An instance of the value of winter records may be cited in the case of Elbow River. Estimates of the possible power development based on records of the flow during the open season were found to be far too high when records of the winter flow were taken.

The survey should be extended eastward to include the streams in the Province of Manitoba. As the market for power is increasing, the time is approaching when every site will be developed. Reliable estimates of the possible power development cannot be made without a knowledge of the water-supply, and as records should extend over a period of several years in order to show the extremes of flow and a reliable mean, it is important that the studies be commenced at the earliest possible date.

The water-supply is one of the most important resources of a country, and an accurate knowledge of the flow of water in nearly all important streams is essential for the solution of many problems in connection with navigation, water-power, irrigation, domestic and industrial water supplies, sewage disposal, mining, bridge-building, river-channel protection, flood prevention, and storage for conservation of flood waters. The records of the survey are being used quite extensively now by engineers and the time is at hand when the field-operations should be extended to include other parts, if not the whole, of the Dominion.

DEFINITIONS

The volume of water flowing in a stream is known as run-off or discharge. In expressing it various units are used, depending upon the kind of work for which the data are needed. Those used in this report are 'second-feet,' 'acre-feet,' 'run-off per square mile' and 'run-off in depth in inches' and may be defined as follows:

'Second-foot' is an abbreviation for cubic foot per second. A 'second-foot' is the body of water flowing in a stream one foot wide and one foot deep at the rate of one foot per second.

The 'acre-foot' is the unit capacity used in connection with storage for irrigation work, and is equivalent to 43,560 cubic feet. It is the quantity required to cover an acre to a depth of one foot.

The expression 'second-feet per square mile' means the average number of cubic feet of water flowing each second from every square mile of drainage area on the assumption that the run-off is uniformly distributed.

'Depth in inches' means the depth of water in inches that would have covered the drainage area, uniformly distributed, if all the water could have accumulated on the surface. This quantity is used for comparing run-off with rain-fall, which quantity is usually given in depth in inches.

It should be noticed that 'acre-feet' and 'depth in inches' represent the actual quantities of water which are produced during the periods in question, while 'second-feet,' on the contrary, is merely a rate of flow per second.

EXPLANATION AND USE OF TABLES

The data obtained and the estimates made therefrom have been compiled in tabulated form and for each regular gauging station are given, as far as available, the following data:—

1. Description of station.
2. List of discharge measurements.
3. Daily gauge-height and discharge table.
4. Table of monthly discharges and run-off.

The description of stations gives such general information about the locality and equipment as would enable the reader to find and use the station. It also gives, as far as possible, a complete history of all the changes that have occurred since the station was established and that might affect the records in any way.

The list of discharge measurements gives the results of all the discharge measurements that have been made at or in the vicinity of the gauging station or have been used in completing the records for the gauging station. It gives the date on which the measurement was made, the name of the hydrographer, the width and area of cross-section, the mean velocity of the current, the gauge-height and the discharge in second feet.

The table of daily gauge-heights and discharges given in this report is a combination of two tables kept in the office of the survey, namely, the table of daily gauge-heights and the station water rating table. The table of daily gauge-heights gives the daily fluctuations of the surface of the above the zero of the gauge, as reported by the observer. During high water, two observations of the gauge were made at some stations, and the gauge-height given in the table is the mean of the observations for the day. The discharge measurements and gauge-heights are the base data from which the other tables are computed. The table of the daily discharges is the discharge in second-feet, corresponding to the stage of the stream, as given by the station rating table.

SESSIONAL PAPER No. 25d

In the table of monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gauge-height was highest. As the gauge-height is the mean for the day, there might have been short periods when the water and the corresponding discharge were greater than given in this column. Likewise, in the column "Minimum" the quantity given is the mean flow for the day when the mean gauge-height was lowest. The column headed "Mean" is the average flow for each second during the month. The computations for the quantities in the remaining columns have been based upon this mean. The drainage area for each gauging station was marked off on the sectional maps of the Department and the area taken off with a planimeter. In many districts, information regarding topographical features is very incomplete and the computed areas are only approximate. As the surveys of the Department are extended and completed these computations will be checked and, if necessary, corrected.

CONVENIENT EQUIVALENTS

The following is a list of convenient equivalents for use in hydraulic computations:—

- 1 second-foot equals 35.7 British Columbia miner's inches, or one British Columbia miner's inch equals 1.68 cubic feet per minute.
- 1 second-foot equals 6.23 British imperial gallons per second; equals 538,272 gallons for one day.
- 1 second-foot equals 7.48 United States gallons per second; equals 646,272 gallons for one day.
- 1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.
- 1 second-foot for one year equals 31,536,000 cubic feet; equals 724 acre-feet.
- 1 second-foot equals about 1 acre-inch per hour.
- 1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
- 1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
- 1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
- 1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
- 1 second-foot for one day equals 1.983 acre-feet.
- 1 second-foot for one 28-day month equals 55.54 acre-feet.
- 1 second-foot for one 29-day month equals 57.52 acre-feet.
- 1 second-foot for one 30-day month equals 59.50 acre-feet.
- 1 second-foot for one 31-day month equals 61.49 acre-feet.
- 100 British Imperial gallons per min. equals 0.268 second-foot.
- 100 United States gallons per min. equals 0.223 second-foot.
- 1,000,000 British Imperial gallons per day equals 1.86 second-feet.
- 1,000,000 United States gallons per day equals 1.55 second-feet.
- 1,000,000 British Imperial gallons equals 3.68 acre-feet.
- 1,000,000 United States gallons equals 3.07 acre-feet.
- 1,000,000 cubic feet equals 22.95 acre-feet.
- 1 acre-foot equals 43,560 cubic feet.
- 1 acre-foot equals 271,472 British Imperial gallons.
- 1 acre-foot equals 325,850 United States gallons.
- 1 inch deep on 1 square mile equals 2,323,200 cubic feet.
- 1 inch deep on 1 square mile equals 0.0737 second-foot per year.
- 1 acre equals 43,560 square feet.
- 1 cubic foot equals 6.23 British Imperial gallons.
- 1 cubic foot equals 7.48 United States gallons.
- 1 cubic foot of water weighs 62.5 pounds.
- 1 foot per second equals 0.682 miles per hour.
- 1 horse-power equals 550 foot-pounds per second.
- 1 horse-power equals 746 watts.
- 1 horse-power equals 1 second-foot falling 8.80 feet.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{Fall in Feet}}{11} = \text{Net Horse-power on Water.}$
 wheel, realizing 80 per cent of theoretical power.

METHODS OF MEASURING STREAM FLOW

There are three distinct methods of determining the surface flow of streams: (1) By measurements of slope and cross-section and the use of Chezy's and Kutter's formulae; (2) by means of weirs, which include any device or structure that by measuring the depth on a crest or sill of known length and form, the flow of water may be determined; (3) by measuring the velocity of the current and the cross-section. The third method is the one most commonly used by this survey. The second is used when the flow is too small to be accurately determined by the third, while the first is only used in making estimates of the discharge of a stream when the only data available are the cross-section and slope.

Slope Method of Determining Discharge.—The slope of a stream, or, rather, of a section of a stream, is the difference in elevation between the upper and lower ends of the section, com-

monly called the fall, divided by the distance or the length of the section. Slope sections vary in length from two or three hundred feet to several hundred feet, depending largely upon the nature of the stream.

It is difficult to ascertain accurately the slope of the water surface in a stream, since in nearly all streams there are pulsations in the water, causing the surface to rise and fall locally. In most streams the slope of the bottom is far from uniform, and the flow of water in any given section is more or less influenced by the flow in the adjacent section, above or below. For this reason it is a good plan to consider a number of adjacent sections, comprising a considerable length of the stream, in one computation, being careful to take into account the diversity of cross-section at various places in the length.

In determining the slope of the surface of a stream, levels are taken of the water surface at each end of the slope section, and referred to some datum or bench-mark. A good plan is to set firmly a stout wooden stake below the water surface at each end of the slope section, and then to drive a nail into the top of each stake, so that the nail-head will exactly coincide with the water surface. The difference in elevation between the two nails-head, divided by the distance between the stakes, will give the slope.

The wetted perimeter is that portion of a stream channel that is in contact with the water. The form or outline of the wetted perimeter of a stream has an important influence upon the velocity of the current. It is usually determined graphically from the plotted cross-section or may be measured by means of a flexible tape or chain after the flood has subsided.

The hydraulic radius, which is sometimes called the mean radius of the channel below the water surface, is found by dividing the area of the cross-section (in sq. ft.) by the length of the wetted perimeter (in feet).

The Chezy formula, which is the fundamental formula for stream discharge, is:

$$Q = A V$$

in which Q = the discharge of the stream in sec.-ft.

A = the area of the cross-section in sq. ft.

V = the mean velocity of flow, in ft. per sec.

In applying this formula to the determination of stream discharge, the mean velocity of a stream is considered a function of the slope and of the wetted perimeter of the stream. This may be expressed by formula as follows:

$$V = C \sqrt{r s}$$

in which r = the hydraulic radius of the channel.

s = the surface slope.

and C is a variable coefficient, depending upon the nature of the channel.

In determining the value of C for any given case it is customary to make use of Kutter's formula, which is:—

$$C = \frac{41.6 + \frac{0.00281}{s} + \frac{1.811}{n}}{1 + \frac{41.6 + \frac{0.00281}{s}}{\sqrt{r}}}$$

In this formula r and s have the same significance as in the Chezy formula and the new factor n is called the coefficient of roughness. It is a variable coefficient, and its value is dependent upon the size, shape, slope and degree of roughness of the channel. Tables of values of n are given in various text books, but it is difficult to choose the correct value. It is, therefore, advisable whenever possible to compute the value of n from a measured discharge. As the slope method of determining discharge is seldom employed except to estimate flood discharge, a current meter measurement is very often made at the slope section, during low water. Having determined the mean velocity, slope and hydraulic radius at the time of the metering, the value of C may be

found from the formula $V = C \sqrt{rs}$ or $C = \frac{V}{\sqrt{rs}}$ Trautwine's Pocket Book for Civil Engi-

neers and other texts contain tables giving the value of n for different values of r , s , and c . From these tables we can interpolate the proper value of n for a particular section of the stream, at low-water stage. In most cases this value of n is applicable to high-water and flood conditions of the stream also and is used with values of r and s for the high-water or flood cross-section to determine the value of C at the higher stage. Having determined the value of C the computation of the discharge is simple.

The results obtained by the slope method are in general only roughly approximate, owing to the difficulty in obtaining accurate data and the uncertainty of the value of n to be used.

Weir Method of Determining Discharge.—As yet no permanent weirs have been constructed by this survey, and the only regular weir measurements have been on small streams by means of a temporary weir. The weir used consists of a wooden base of 2-inch plank, to which is bolted a rectangular notch of three-eighths inch steel with bevelled edges.

In making a measurement by means of a temporary weir, the following directions should be followed as far as possible. The weir should be placed perpendicular and at right angles to the bed of the stream with the crest level. The discharge should be free in so much as the *nappe*

SESSIONAL PAPER No. 25d

should have sufficient fall to allow air to have free circulation underneath it, and the head or depth on the crest should not exceed one-third of the length. The channel of approach should be several times as wide as the opening and the depth of water in the bay or pond should be at least twice the head on the weir, so as to eliminate velocity of approach and cross-currents. In choosing a site for a weir, a point should be chosen that will fulfil the above conditions and give a good sized bay or pond.

To set up a temporary weir, a dam of sods and earth are thrown across the stream, the weir set in place and the sods tramped firmly around it to stop all leakage. On a stream with a sandy bed, sods or clay must be placed on the bottom for a few feet upstream to form a mattress to prevent the undermining of the dam.

After the bay has filled up, the head of the water is observed by taking the difference in elevation of the crest of the weir and the elevation of the water surface in the bay at a distance of 4 to 10 feet from the weir, with an engineer's level. Two common methods of getting the elevation of the water surface are (1) hold the levelling rod on a stone or other solid body under water and subtract the depth of water on the rod from the sight on the rod; (2) drive a pin divided into tenths of feet into the bed of the stream so that an even tenth is level with the surface of the water, then hold the levelling rod on the top of the pin and add the length of pin above the water to the sight on the rod.

When the head of water has been determined, the discharge is computed by using one of the standard formulae which will suit the case. Tables giving the discharges for different heads and lengths of crests are published in many engineering texts.

The formula used by this survey for rectangular sharp-crested weirs is:

$$Q = 3.33 (L - .2H) H^{3/2}$$

being a modification of Francis' formula, to allow for end contractions and elimination of velocity of approach.

in which Q = discharge in sec. ft.; L = length of crest in feet; H = head in feet.

Measurements by means of temporary weirs should be made some distance above or below the gauge. If they are made close to a gauge, the gauge must be read before the weir is placed in the stream and the pond must be allowed to run off after the weir is removed before the gauge is re-read.

Velocity Method of Determining Discharge.—There are two methods of determining the velocity of flow of a stream, namely, direct and indirect. In the direct method, by which the velocity is determined by means of floats, the liability of error is large, and the results far from satisfactory. This method is seldom used except for very rough estimates or when a current meter cannot be used. There are three common kinds of floats, viz: surface, sub-surface and tube or rod floats. In each the procedure is the same. A straight piece of channel is selected for the run and two cross-sections taken at some convenient distance apart, usually from 100 to 200 feet. They are then divided into strips by means of a tagged wire. The velocity in each strip is then measured by noting the time taken by the float in traversing the run or distance between the two cross-sections. As the time and distance are both known the velocity can easily be computed. The velocity, whether measured by surface, sub-surface or tube floats, must be multiplied by a coefficient less than unity to reduce the mean velocity before being used to compute the discharge.

The indirect, or current-meter, method is the most reliable and most widely used method of determining the velocity of the flow of a stream. The meter used by this survey is the Price Patent, manufactured by W. & L. E. Gurley, Troy, N.Y. It consists of six cups attached to a vertical shaft which revolves on a conical hardened steel point when immersed in moving water. The number of revolutions is indicated electrically. The rating of relation between the velocity of the moving water and the revolutions of the wheel is determined for each meter by drawing it through still water for a given distance at different speeds and noting the number of revolutions for each run. From this data a rating table is prepared which gives the velocity per second of moving water for any number of revolutions in a given time-interval.

The accuracy of a discharge measurement taken at a velocity-area station is dependent on two factors, namely, the accuracy with which the area of the cross-section and the mean velocity of the flow normal to that section are measured. There is no special difficulty in measuring the first factor, but the second, the velocity, is very difficult to measure accurately, because it is constantly changing. It varies not only from the surface to the bottom but from one bank of the stream to the other, making it necessary to measure it at a number of points.

In making a measurement with a current meter, a number of points, called measuring points, are measured off above and in the plane of the measuring section, at which observations of depth and velocity are taken. These points are spaced equally for those parts of the section where the flow is uniform and smooth, but should be spaced unequally for other parts according to the discretion and judgment of the engineer. In general, the points should not be spaced farther apart than five per cent. of the distance between piers, nor farther apart than the approximate mean depth of the section at the time of the measurement.

The measuring points divide the total cross-section into elementary strips, at each end of which observations of depth and velocity are made. The discharge of any elementary strip is the product of the average of the depths at the ends, the width of the strip, and the average of the mean velocities at the two ends of the strip. The sum of the discharges of the elementary strips is the total discharge of the stream.

METHODS OF DETERMINING MEAN VELOCITY

There are a number of different methods of determining the mean velocity at the ends of these strips, or, as it is commonly called, the 'mean velocity in a vertical', namely, multiple-point, single-point, and integration. These three principle multiple-point methods in general use are the vertical velocity-curve, three-point, and two-point method.

Vertical-velocity Curve Method of Determining Mean Velocity.—In this method the centre of the meter is held as close to the surface of the water as is possible, being careful to keep it out of reach of all surface disturbances, and then at a number of different depths throughout the vertical. The velocity at each position of the meter is recorded. These observations are then plotted with velocities in feet per second as abscissae and their corresponding depths in feet as ordinates and a mean curve is drawn through the points. The mean velocity for the vertical is obtained by dividing the area bounded by the curve and its axis by the depth. In the absence of a planimeter for measuring the area, the depth is divided into 5 to 10 equal parts, and the velocities of the centre ordinates of these parts are noted. The mean of these velocities will very closely approximate the mean in the vertical.

It is often more convenient, when the depth is a number of feet and a fraction, as 7.4, to divide the depth into 7 parts of a foot width, and a part of 0.4 foot width. Then the velocity to enter for the narrow part is 0.4 of the velocity at the centre of it.

The vertical-velocity curve is useful in studying the manner in which velocities occur in a vertical. From a study of a number of these curves the other shorter methods of determining mean velocity are deduced. This method is not used in general routine measurements, except during the winter, on account of the length of time taken to complete a measurement, for a change of stage is almost sure to occur during a measurement on a large stream which counterbalances the increased accuracy. For this reason its use is limited to the determination of the coefficient to be used in the reduction of values obtained by other methods of measuring velocity to the true value, to the measurement of velocities under new and unusual conditions of flow, and for measurements under ice.

Three-Point Method of Determining Mean Velocity.—This method gives the greatest accuracy outside of the vertical-velocity curve and is the method most commonly used by this survey during the open season. The meter is held at 0.2 in., 0.6 in., and 0.8 in. depth. The mean velocity is then obtained by dividing by 4 the sum of the velocities at 0.2 and 0.8 depth plus twice the velocity at 0.6 depth. It is the best method to use during low water, or in wide shallow streams having a rough bed, where the thread of mean velocity varies considerably from the 0.6 depth.

Two-Point Method of Determining Mean Velocity.—In studying the vertical curves made at a number of different points and under varied conditions it has been found that the mean of the velocities occurring at 0.2 and 0.8 depth gives very nearly the mean velocity in the vertical. Use is made of this fact in the two-point method of determining mean velocity, the meter being held at 0.2 and 0.8 depth in the vertical. This method has been found more accurate than the single point method and the time required for a metering is not very much greater. This method has been found to give, also, a very close approximate to the mean velocity in measurements of ice-covered streams, although these flow under very different conditions from those of open water.

Single-Point Method of Determining Mean Velocity.—Experiments made under most favourable conditions and extending over a long period have established the point of mean velocity in a vertical at 0.6 of the depth. Therefore the error resulting from the use of the 0.6 depth as the depth of mean velocity is very small, though in some few cases a study of the vertical-velocity curve will show the need of a coefficient to reduce the observed velocities to the mean. The variation of the coefficient from unity in individual cases is, however, greater than the two- or three-point method and the general results are not as satisfactory. For that reason this method is not employed very extensively by the survey.

In the other principal single-point method the meter is held near the surface, at from 0.5 to 1 foot below the surface, care being taken to sink the instrument below the influence of wind or waves. The resulting velocities must be multiplied by a coefficient to reduce them to mean velocities. This coefficient, as found by a large number of experiments, varies from 0.78 to 0.98, depending upon the depth and speed of the stream. The deeper the stream and the greater the velocity, the larger the coefficient. In flood work coefficients varying from 0.90 to 0.95 should be used. This method is only used when the current is too strong to permit the sinking of the meter to any great depth below the surface of the water. It is often employed at times of flood, or when a stream is carrying a lot of drift wood or ice.

Integration Method of Determining Mean Velocity.—This method of determining the mean velocity in a vertical consists in moving the meter at a slow uniform speed from the bed of the stream to the surface and return in a vertical direction, the time and revolutions being observed. In travelling through all parts of the vertical the meter is acted upon by each and every thread of velocity from the bed to the surface of the stream, and the resulting observations determine the mean in that vertical.

This method is very useful in checking the results of other methods. It is, however, seldom used by this survey, as the Price meter is not suited to observations by this method, since the vertical motion of the meter causes the wheel to revolve.

DEPARTMENT OF THE INTERIOR IRRIGATION OFFICE

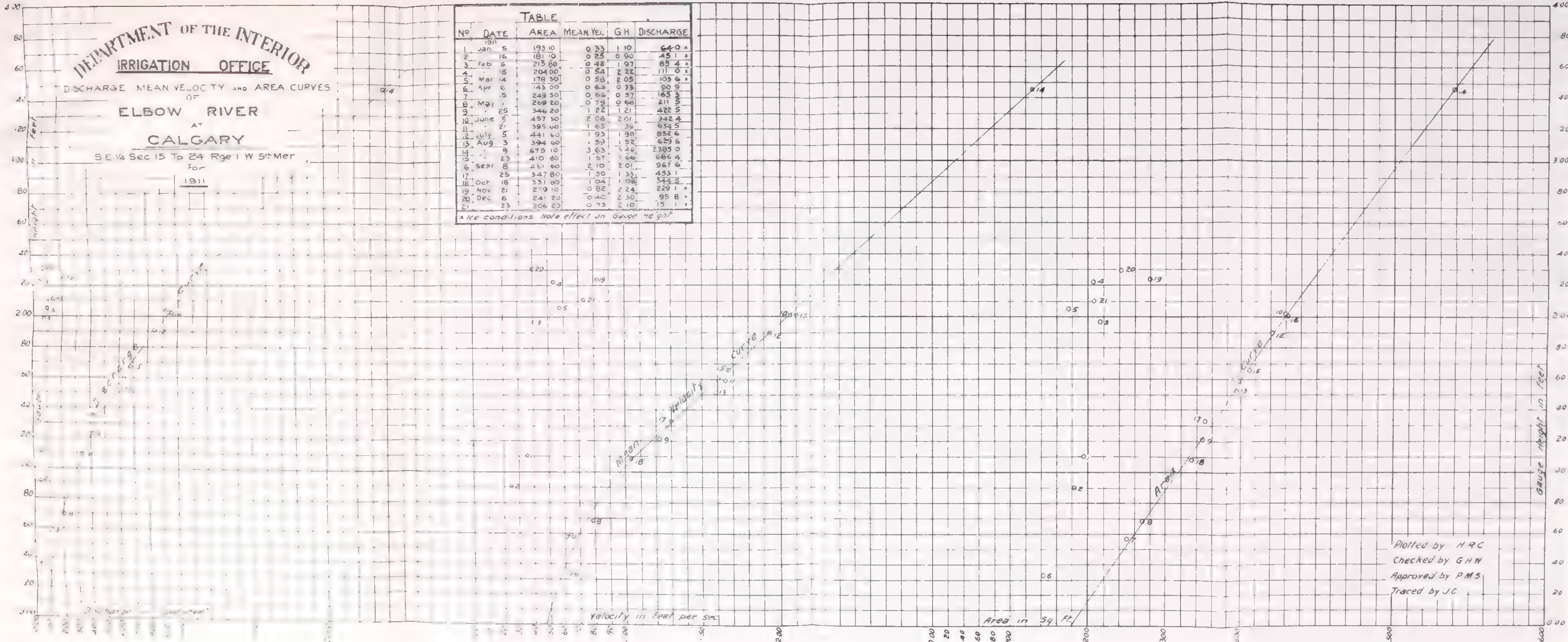
DISCHARGE MEAN VELOCITY AND AREA CURVES
OF

ELBOW RIVER
AT
CALGARY

SE 1/4 Sec 15 Tp 24 Rge 1 W 5th Mer
for
1911

No.	DATE	AREA	MEAN VEL.	G.H.	DISCHARGE
1	Jan 5	193.10	0.33	1.10	64.0
2	Jan 16	181.10	0.25	0.90	45.1
3	Feb 6	215.60	0.42	1.97	85.4
4	Feb 18	204.00	0.54	2.25	111.0
5	Mar 14	178.30	0.58	2.05	103.6
6	Apr 6	143.00	0.64	0.73	90.9
7	Apr 15	249.50	0.66	0.97	165.3
8	May 1	269.20	0.73	0.68	211.9
9	May 25	346.20	1.22	1.21	422.5
10	June 5	457.30	2.06	2.01	342.4
11	June 21	395.60	1.65	3.5	654.5
12	July 5	441.60	1.93	1.90	852.6
13	Aug 3	394.60	1.53	1.52	629.6
14	Aug 9	675.10	3.63	3.46	2385.0
15	Aug 23	410.80	1.57	1.66	686.4
16	Sept 8	461.60	2.10	2.01	967.6
17	Sept 25	347.80	1.30	1.33	453.1
18	Oct 18	331.80	1.04	1.08	344.5
19	Nov 21	279.10	0.82	2.24	229.1
20	Dec 6	241.20	0.40	2.30	95.8
21	Dec 23	206.20	0.73	2.10	15.1

Ice conditions Note effect on Gauge height



Plotted by HRC
Checked by GHW
Approved by PMS
Traced by JC

parently
straight
moderate
observer.
ice. In
inversion
above
establish
the lines,
m.

s. The
depth
nsisting
one of
may be
stand

ved the
currents,
led to a
t of the
rker on
marked

In that
cable is
fourths
passing
ly to a
e lower
thorage
ually a
A cage
e cable
ay-line,
stream
on this

definite
of the
proach-
obtained
eferred
ording
From
eliable,
stream
section
uitable
he dis-
r than
auging
to the
ed and

invest-
igated.
charge
rtical-
as the
which

Department of the Interior

IRRIGATION OFFICE

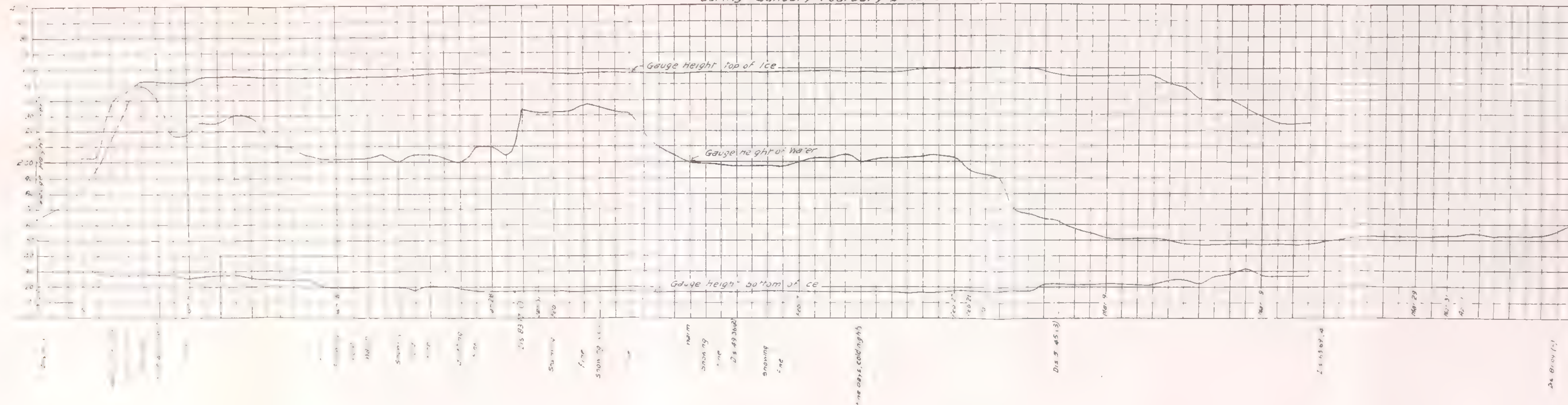
DIAGRAM SHOWING

Gauge Height of Top of ice, water surface, and bottom of ice
at Gauging Station

оп

BOW RIVER AT LAGGAN. ALTA.

during January February & March - 1911



Note the variation in Gauge height of water which does not always change in accordance with the weather.

Plotted by: JRC
Traced by: JC

GAUGING STATIONS

The first step is to select a suitable locality for a gauging station. Although apparently simple, this is really a difficult task. Not only must the water be moving in nearly straight lines over a solid bed and between well defined banks, but the place must be accessible at moderate cost, and there must be living near a competent person who can be engaged to serve as observer. Permanent gauging stations should only be selected after a very thorough reconnaissance. In the irrigation districts and in more thickly populated districts there is more or less diversion of water. This is apt to complicate matters for the hydrographer, or a gauging station above all works may not include all the tributaries of the stream and it is often necessary to establish gauging stations at several points along the streams, and on tributaries, canals and pipe lines, in order to obtain complete information regarding the water-supply in a particular stream.

There are three classes of gauging stations; namely, wading, bridge and cable stations. The wading station can, of course, be used only in the case of small streams having a maximum depth at its highest stage of three feet or less. The equipment for a wading station is small, consisting usually of a plain staff gauge, graduated to feet and hundredths, and fixed vertically to one of the banks of the stream. For convenience a measuring line, usually a wire with tags, may be fixed permanently at this section. When taking the reading, the hydrographer should stand below and to one side of the meter, so as to not cause eddies in the water.

Bridge stations, because of their permanency and the freedom of movement allowed the hydrographer, are much preferred. Very often, however, more particularly in swift currents, the piers materially affect the accuracy of the results. When the gauge cannot be attached to a pier, it is often attached horizontally to the guard-rail or floor of the bridge and the height of the stream is found by lowering a weight by a chain over a pulley. It is indicated by a marker on the chain. Distances of three, five, or ten feet, according to the size of the stream, are marked on the lower chord of the downstream side of the bridge, to serve as a measuring line.

Frequently it is impossible to establish a permanent gauging station at a bridge. In that case the wire cable of a ferry can be utilized, or, if that is not available, a permanent wire cable is stretched across the river. For spans of average length a galvanized wire cable three-fourths of an inch in diameter is safe. It is supported at each bank by means of high struts or by passing it through the crotch of a tree. The cable is run into the ground and anchored securely to a 'deadman' buried at least six feet below the surface, or, if convenient, it is anchored to the lower part of the trunk of a tree. A turnbuckle is inserted in the cable between the strut and anchorage to permit tightening the cable when it begins to sag. A permanent measuring line, usually a wire, with tags five or ten feet apart, is stretched across the stream just above the cable. A cage large enough to carry two men and instruments is constructed and suspended from the cable by means of cast-iron pulleys. The cage is moved from point to point by hand. A stay-line, usually quarter-inch guy wire, is stretched across the stream about thirty to forty feet upstream from the cable, and securely fastened. By passing a sash cord through a pulley hung on this stay line the current meter is prevented from being carried down stream.

LOW-VELOCITY LIMITATIONS

Owing to the presence of a slight amount of friction in the current-meter, a certain definite velocity is required to make the wheel revolve, *i.e.*, to overcome the frictional resistance of the wheel. For this reason the meter is unsuitable for the measurement of low velocities, approaching this value. This velocity, which is required to overcome friction, and which is obtained from the meter-rating curve, is called the velocity of no flow for the particular meter referred to. It varies in different types of meters, and also slightly in meters of the same type, according to the time the meter is in use, but very seldom exceeds 0.2 foot per second in any meter. From a number of observations the low-velocity limit, below which values of velocity are unreliable, is found to be 0.5 foot per second. In many cases at low stages the gauging station on a stream becomes unsuitable for a discharge measurement, owing to the mean velocity in the section falling below the safe limit. In such instances, where it is possible to wade the stream, a suitable gauging section may be located within a reasonable distance of the regular station and the discharge measurements made at this point. When a gauging is made at a cross-section other than the regular station, sufficient soundings should be made at the latter at the time of the gauging to develop the cross-section and compute the area. The measurement is thus referred to the regular gauging station and the mean velocity and area at the regular section is reported and used in the office computations.

WINTER MEASUREMENTS

The laws governing the flow of streams in open channels have, through extensive investigations, become well defined, but the flow under an ice-cover has been but little investigated. In winter, as in summer, the daily discharge of a stream is computed from frequent discharge measurements and daily gauge-height observations. In most cases, however, the vertical-velocity curve method is used for the determination of the mean velocity in the vertical, as the mean velocity varies considerably. In fact, there are usually two points in the vertical at which

the thread of mean velocity occurs under an ice cover. These points are near 0.2 and 0.8 depths and the two-point method will give fairly accurate results, but in this report all discharges are based on computations from vertical-velocity curves.

The discharge measurements are made through holes in the ice from five to ten feet apart, and large enough to allow the meter to pass through freely. The measurement is then taken in the same manner as at open sections, except that the depth of the stream is taken at the distance from the bottom of the ice to the bed of the stream. The soundings, however, are always referred to the surface of the water in the holes, the distance from the surface of the water to the bottom of the ice being measured and subtracted from the sounding to obtain the depth. The meter should be kept in the water continuously to prevent the wheel from freezing and sticking.

The gauge is read once a day, the observer noting the elevation of the water as it rises in a hole cut through the ice, the height of the top of the ice, the thickness of the ice, presence of needle or slush ice, snow on top of ice, ice-jams, and also any sudden changes in temperature. To do this the observers are provided with an ice chisel for chopping holes, and a square to measure the thickness of the ice. Any form of gauge may be used but the chain gauge is the most satisfactory, as the staff gauge, being frozen to the ice, heaves with it.

Some of the cross-sections used in the summer were found to be unsuitable for winter measurements. This was usually caused by the cross-section filling up with slush, needle or anchor ice. There is a flow through this ice, and it is impossible to measure it. The most suitable stations for winter measurements are those where there is a long stretch of very smooth sluggish water above the station and a rapid fall below.

There are certain conditions in Western Canada which make it exceptionally difficult to make estimates of the daily discharge during the winter. The gauge-height in many cases fluctuates very much, and often sudden rises or drops occur. The rises are often explained by the fact that during very cold spells a great deal of slush, frazil and anchor ice is formed and chokes up the channel, thus raising the surface of the water, when in reality the discharge is decreasing. Then, again, a 'Chinook' causes a sudden rise in temperature, and the discharge is often increased, while at the same time the gauge-height gradually lowers, evidently because the warmer water and weather has melted out a lot of the ice from the channel and given it a greater carrying capacity. So far the investigations have proved that, in order to make reliable estimates of the daily discharge, gaugings must be made at short intervals and the weather conditions and temperature must be very carefully noted. There is under the present methods a great deal of work in calculating the discharge by the vertical-velocity curve method and in estimating the daily discharge during the winter months, but as yet no improved or shorter methods have been discovered. It is hoped, however, that, in the near future, the laws governing the flow under ice will be better understood and shorter and easier methods evolved.

A report on the winter conditions in the Banff district during the winter of 1911-12, by V. A. Newhall, district hydrographer, which is appended, explains more fully the difficulties experienced in the field-work during the winter.

RE-RATING OF CURRENT METERS

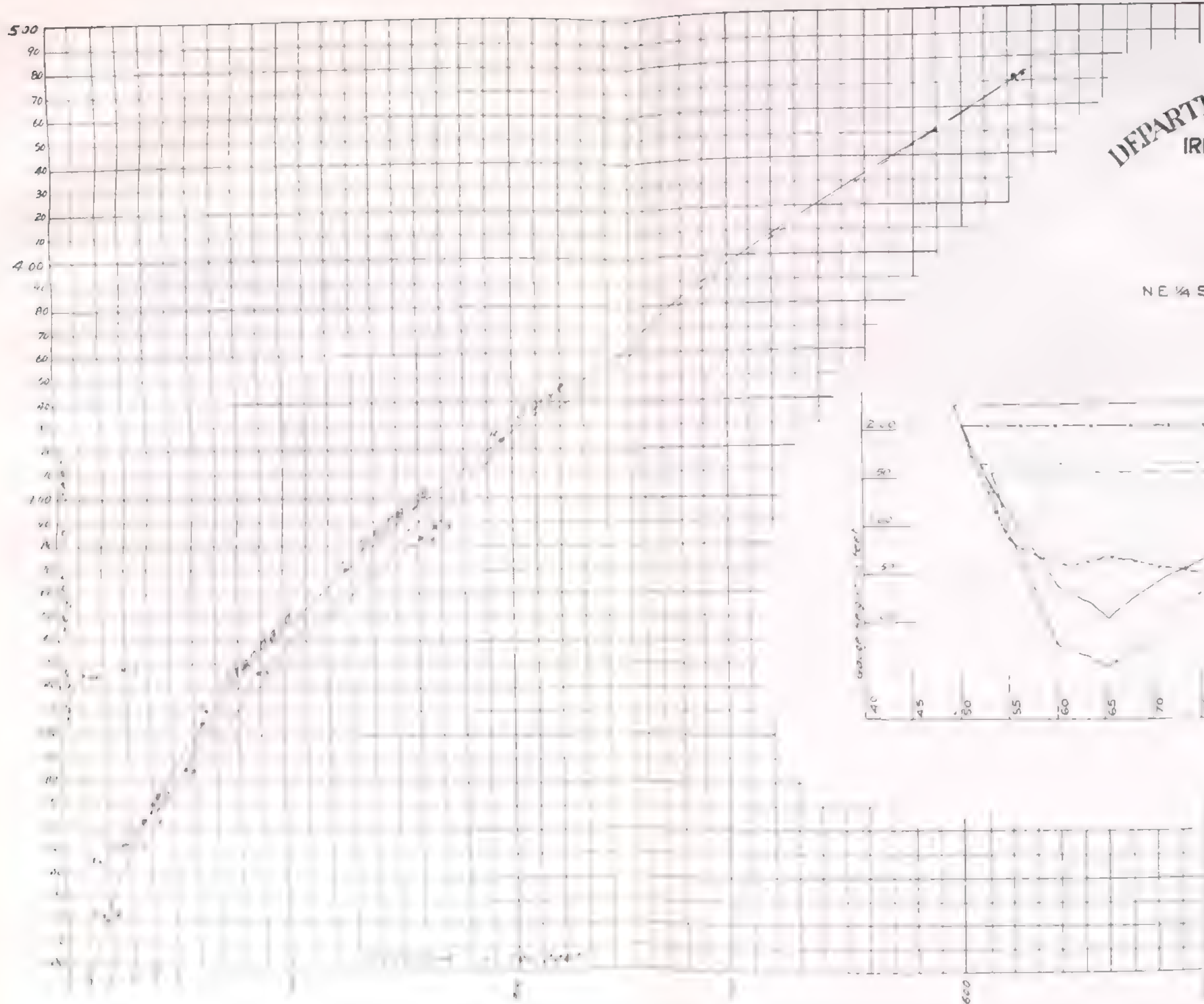
Each meter is rated before being used, in order to determine the relation between the revolutions of the wheel and the velocity of the water. The meter is driven at a uniform rate of speed through still water for a given distance, and the number of revolutions of the wheel and the time are recorded. From this data the number of revolutions per second and the corresponding velocity per second are computed. Tests are made for speeds varying from the slowest which will cause the wheel to revolve to several feet per second. The results of these runs, when plotted with revolutions per second as abscissae and velocity in feet per second as ordinates, locate points that define the meter-rating curve, which for all meters is practically a straight line. From this curve a meter-rating table is prepared. Theoretically, the rating for all meters of the same make and type should be the same, but as a result of slight variations in construction, and in bearing of the wheel on the axis at different velocities, the ratings differ. After a meter has been in use for some time the cups may have received small injuries, or the bearing of the wheel on the axis may have changed owing to unavoidable rough usage. These changes will affect the running of the meter and change its rating. As a consequence each meter is re-rated at regular intervals and a new rating curve and table prepared.

Particulars of the rating station and a discussion of the methods employed in, and the results of, ratings are republished from the report on Irrigation and Canadian Irrigation Surveys as an appendix to this report.

OFFICE COMPUTATIONS

Rating Curves and Tables.—When a series of discharge measurements has been made at a gauging station a rating curve is constructed for that station, showing graphically the discharge corresponding to any stage of the stream within the limits covered by the gaugings. This curve, as it is usually drawn, has an abscissae, the discharges in second-feet and as ordinates, the corresponding gauge heights at which the discharges were made. A smooth curve is drawn through the resulting set of points and from this curve the discharges at any stage within the limits of the curve are taken. Some measurements may be more reliable than others, owing to more or less favourable conditions at different times of gauging, or to other causes. In order to obtain the weight of the different measurements, curves with area and mean velocity, as abscissae, and gauge heights as ordinates, are also drawn. From a study of these curves any discrepancies

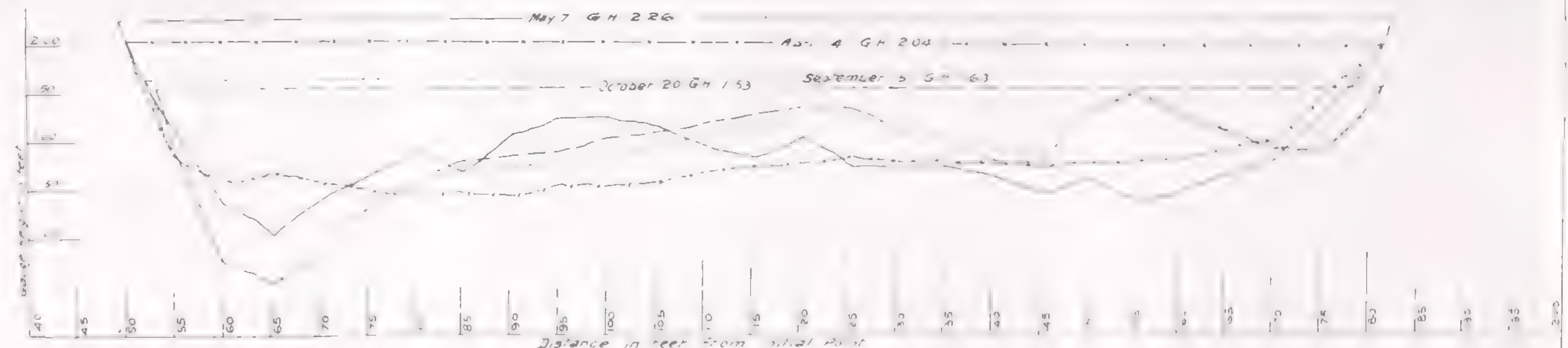




DEPARTMENT OF THE INTERIOR
IRRIGATION OFFICE
DISCHARGE CURVE
OF
MILK RIVER
AT
MILK RIVER
NE 1/4 Sec 21 Tp 2, Rge 16 W 4th Mer
for
1911.

TABLE				
No	DATE	AREA	MEAN VEL	GH
1	Apr 14	160.51	61	2.04
2	May 2	141.08	53	1.85
3	7	186.30	1.92	2.26
4	17	484.14	3.50	4.72
5	22	157.40	1.68	2.10
6	June 12	113.83	1.42	1.70
7	28	245.10	2.09	2.70
8	July 5	20.80	1.45	1.74
9	29	69.82	1.08	1.20
10	Aug 10	128.58	1.34	1.73
11	30	67.47	.99	1.22
12	Sept 7	294.50	2.66	3.24
13	8	263.11	2.48	2.83
14	9	259.15	2.48	2.83
15	15	102.34	1.45	1.63
16	Oct 4	83.75	1.36	1.53
17	20	85.82	1.32	.53
18	Nov 10	45.9	.92	.45
19	Dec 1	101.67	.8	2.28
20	29	53.35	0.90	2.25

Ice conditions have effect on Gauge



Sections showing changes in River Bed

Note - Bolster Method used in estimating the daily discharge during periods of changing conditions

Plotted by E. D.
Checked by A. H.
Approved by H. H.
Issued by

PLATE NO. 6.



Meters and Equipment for Measuring the Discharge of a Stream
by the Velocity Method. Photo by F. H. Peters.

PLATE NO. 7.



Gauging a Small Creek with a 15-inch Weir. Photo by R. J. Burley.

SESSIONAL PAPER No. 25d

in a measurement, either in its area or mean velocity, may be detected. Should it be necessary to extend the rating curve beyond the limits of actual discharge measurements the area and mean velocity curves may be constructed to the stages for which the discharge curve is desired and the latter found by taking the product of the two curves. The discharge curve under natural conditions of flow is always convex to the gauge height axis. The area curve is either a straight line or is convex to the gauge height axis, except in the case of overhanging banks when it becomes concave to the axis. The mean velocity curve is always concave to the gauge height axis, except in cases where standing water occurs below the stage of no-flow. In this case the curve will assume a reverse form, starting from the gauge height of zero flow with a curve convex to the gauge height axis and gradually reversing to a curve concave to this axis. In plotting all three curves the horizontal and vertical scales should be so chosen that the curves may be used within the limits of accuracy for the work, and in their critical position will make, as nearly as possible, angles of 45 degrees with each axis.

The rating curve being constructed it becomes necessary to prepare a station rating table, giving the discharge at any stage of the stream within the limits of the daily gauge height observations on record. From this rating table the daily discharges corresponding to the daily gauge heights are read and tabulated. The rating table is constructed for tenths, half-tenths, or hundreds of feet, according to the readings of the gauge to which it is to be applied. The discharges for this table are read directly from the rating curve and are then adjusted so that the differences for successive stages shall be either constant or gradually increasing, but never decreasing, unless the station is affected by backwater.

Daily Discharge, Monthly Mean and Run-Off.—The rating table being made to cover the range of daily gauge height observations, the next procedure in the computations is to make out a table of daily discharges from this rating table. The daily gauge heights are copied as they were sent in by the observer and opposite each the corresponding discharge is filled in from the rating table. The monthly discharge is found by totalling the daily discharges for the month in question and the monthly mean is obtained by dividing this total by the number of days in the month.

The run-off is computed with two different sets of units, depending upon the kind of work for which the data is intended, as follows: (1) Run-off in inches is the depth to which a plane surface equal in extent to the drainage area would be covered if all the water flowing from it in a given time were conserved and uniformly distributed thereon; it is used for comparing run-off with rain-fall, which is usually expressed in depth in inches. The mean run-off in second-feet per square mile for each month is used. The monthly mean run-off in second-feet is divided by the area of the drainage basin in square miles to find the monthly mean run-off per square mile. This result, reduced to run-off in depth in inches for the monthly period, is in the form required.

(2) The run-off in acre-feet is the form of most use in connection with storage. An acre-foot is equivalent to 43,560 cubic feet, and is the quantity of water required to cover an acre to the depth of one foot. The monthly mean run-off in second-feet is used for the computation of run-off in acre-feet. The monthly mean is reduced to cubic feet per month and this quantity divided by 43,560 gives the run-off in acre-feet.

The run-off of the stream being computed both in depth, in inches and in acre-feet for each month, the run-off for the period, during which observations of run-off were made, is found by the summation of the amounts of run-off for the several months making up this period.

Changing Conditions of Channel.—On streams such as Milk River, whose bed is in a constant state of motion, measurements of discharge should be made every few days, otherwise considerable data relating to changes cannot be obtained. For discharges on days other than those on which measurements are taken, the interpolation method is used. The two methods of interpolation in general use are the Stout and Bolster methods.

The Stout method deals with the correction of the gauge heights. A curve is drawn, using the difference between the actual gauge heights at the time of measurement and the gauge height corresponding to the measured discharge as ordinates and the corresponding days of the month as abscissae. From an irregular curve drawn through these points corrections for gauge heights can be made for days on which there was no discharge measurement. When the discharge is greater than that given by the curve the correction is positive and vice-versa. Each daily gauge height is corrected by the amount shown on the correction curve, and the corresponding discharge taken from an approximate rating curve for the station.

The Bolster method deals more particularly with the modification of the discharge. Results of discharge measurements covering a whole year or season are plotted, and though considerably scattered, will define one or more regular curves, called standard curves, the number and position of each indicating the radical changes. Where the river bed changes from day to day, the position of the standard curve also varies and must pass through the points indicating the different days. The points indicating two successive measurements are joined by a line, which for short distances on the cross-section paper is a straight line and otherwise a curve. This line is divided into a number of equal parts, each indicating an intervening day, the assumption being that as the change during this period is gradual the daily rating must pass through each point, or day, as represented by the divisions. A simple and convenient way of making these interpolations and moving the daily rating curve is to make a tracing of the standard curve with a vertical line of reference. By keeping the lines of reference coincident this curve can be shifted into any desired position and the discharge read for any gauge height.

NORTH SASKATCHEWAN RIVER DRAINAGE BASIN

General Description

The North Saskatchewan River draws its water-supply from the eastern slope of the Rocky mountains. The basin is bounded on the south by that of the Red Deer River and on the north by that of the Athabaska River. Its principal tributaries in the mountain district are the Clearwater and Brazeau Rivers. In addition to these there are a great number of smaller streams draining into the river. From the City of Edmonton the river takes a north and easterly course for about forty or fifty miles, and then flows in an easterly direction to its junction with the South Saskatchewan River, a few miles east of the city of Prince Albert, Saskatchewan. From this point it is known as the Saskatchewan River. The greater part of the drainage basin in the prairie section lies to the south of the river and the principal tributaries are the Vermilion and Battle rivers, the former emptying into the main stream north and a little west of the town of Lloydminster, and the latter in the town of Battleford.

In the mountain section the North Saskatchewan River and its tributaries have well defined rocky valleys with a large amount of fall, and the whole drainage basin is well wooded. The valley of the stream widens out as it gets out to the prairies, and gives rise to large fertile flats. The timber in this part of the drainage basin is confined mostly to the river valley. The stream-bed changes from a rocky and fairly solid formation in the mountain district to a gravelly, sandy and very unstable bed as the river comes out on the prairies.

The stream receives the greater part of its water-supply from the mountains. In consequence, the high water occurs in the hot months of summer, caused by the melting snow from the mountains. The low-water period occurs in the winter months, when there is a minimum amount of drainage from the snow fields.

Three stations were established on the main stream in 1911, and daily records of gauge-height were taken at these stations during the season, as well as discharge measurements at regular intervals. These three stations were located at Edmonton, Battleford and Prince Albert. The only tributary touched upon as yet is Battle River, a gauging station having been established on it at Battleford in 1911.

NORTH SASKATCHEWAN RIVER AT PRINCE ALBERT, SASK.

This station was established October 2, 1911, by J. C. Keith. It is located at the Canadian Northern railway and traffic bridge in the town of Prince Albert on River Lot No. 76, Prince Albert Settlement.

Discharge measurements are made from the downstream side of the bridge, which is a seven-span steel structure on cement piers and abutments. The initial point for soundings is 25 feet north of the iron post at the end of the hand-rail of the bridge, and is suitably marked on the guard-rail of the bridge.

The channel is straight for about one mile above and 300 feet below the station. Both banks are high and will not overflow. The bed is composed of coarse gravel and boulders with a silting of sand near the piers.

The gauge is a plain staff, graduated to feet and hundredths, attached to the shore face of the concrete pier close to the right bank of the stream. It is referred to a Public Works Department bench-mark on a brass bolt on the top of the right abutment at its downstream side, marked 'P.W.D. B.M.47'; the elevation of this bench-mark is 1489.202 feet above mean sea-level. The elevation of the gauge datum is 1456.097 feet.

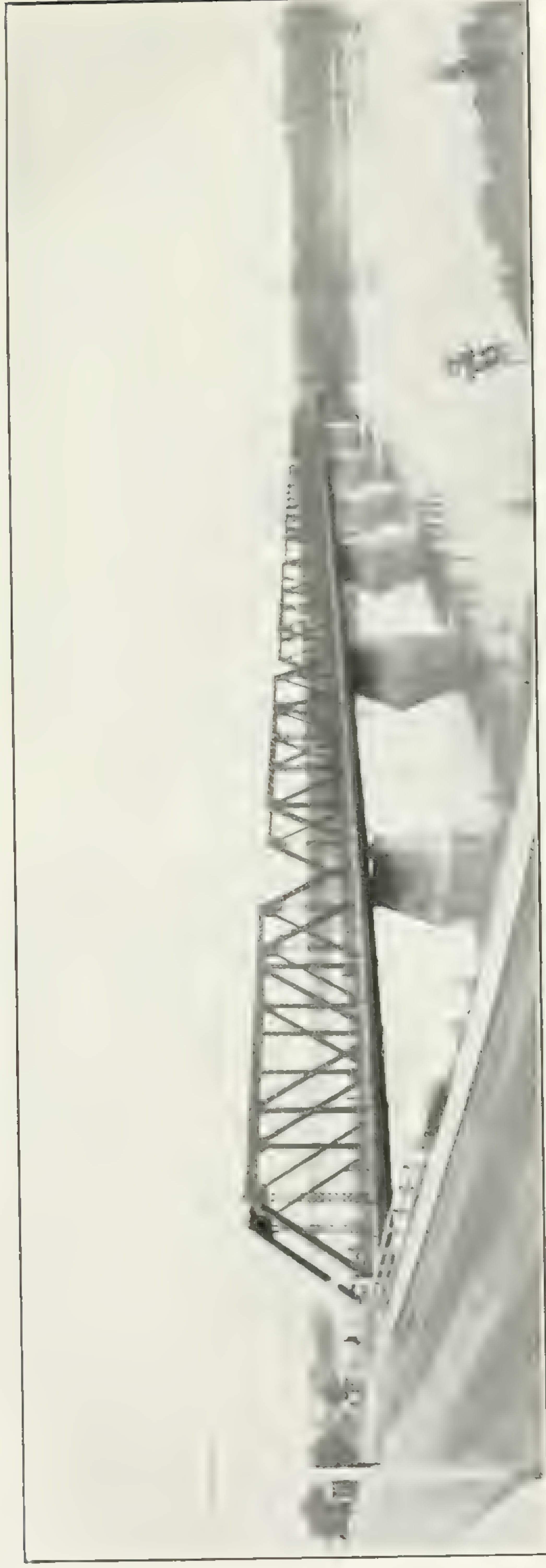
The gauge was read once daily by L. Murray, of Prince Albert.

As only a few discharge measurements were made during 1911, there are not sufficient data to make accurate estimates of the daily discharge. Tables of daily gauge-heights, daily discharge, and monthly discharge, for 1911, will be prepared during 1912 and published with the records for that year.

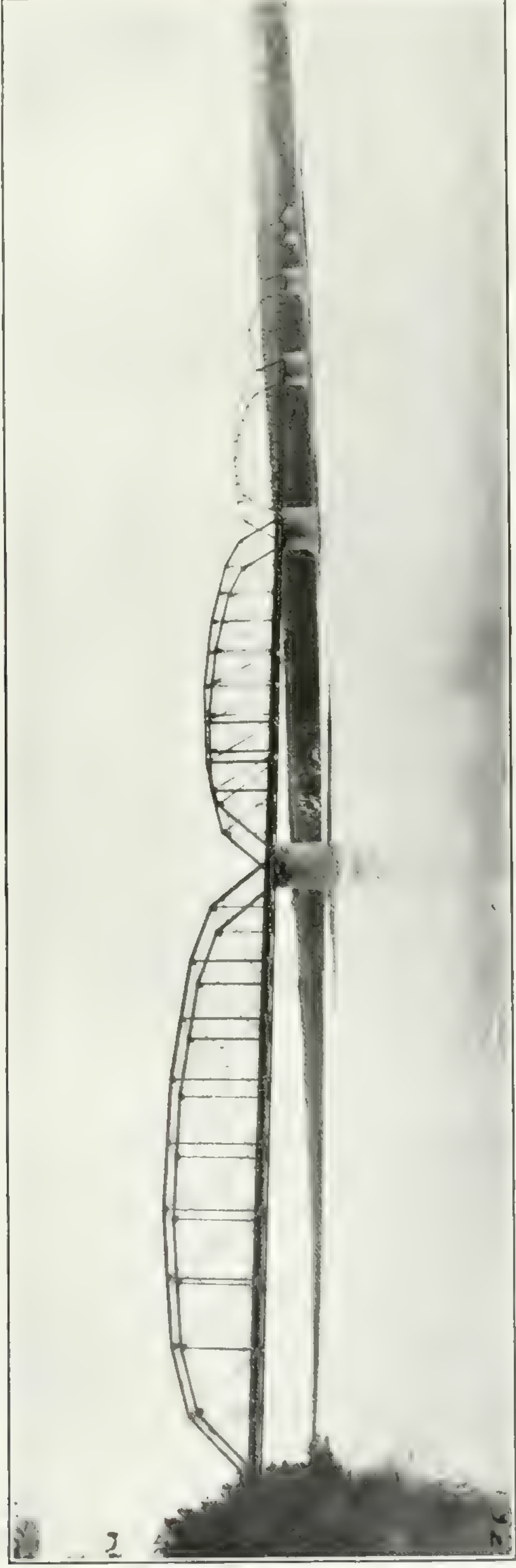
DISCHARGE MEASUREMENTS OF NORTH SASKATCHEWAN RIVER AT PRINCE ALBERT, SASK., in 1911

Date	Hydrographer.	Width	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
Oct. 2 and 3.....	J. C. Keith.....	794	4874.8	2.14	6.286	10,449
Nov. 24 and 25.....	do	800	2463.5	1.11	4.265	2,757†
Dec. 14 and 15.....	do .....	...	2345.2	1.13	4.586	2,671†

† Ice conditions.



Railway and Highway Bridge at Prince Albert. Used as a Gauging Station. Taken by F. H. Peters.



Traffic Bridge over the North Channel of North Saskatchewan River at Battleford, Sask. Used as a Gauging Station. Taken by F. H. Peters.

SESSIONAL PAPER No. 25d

NORTH SASKATCHEWAN RIVER AT BATTLEFORD, SASK.

This station was established May 16, 1911, by H. R. Carscallen. It is located at the traffic bridge in the town of Battleford on the northeast quarter of Section 29, and the southwest quarter of Section 33, Tp. 43, Rge. 16, west of the 3rd Mer. A large island in the river at this point divides the stream into two channels and the river is spanned by two steel bridges, one over each channel. The bridge over the north channel is a five-span steel structure on cement piers and abutments; the south bridge is a three-span steel structure on cement piers and abutments. The two channels necessitate the existence of two gauges, one in each channel.

Discharge measurements are made from the downstream side of the bridges. The initial point for soundings for each channel is the north end of the hand-rail on the downstream side of the bridge, and distances are marked at every ten feet on the hand-rails.

The north channel is straight for about 1500 feet above and 1200 feet below the station. The right bank is high, gravelly and free from brush. The left bank is comparatively low, wooded and will overflow at high stages. The bed of the stream is very sandy and shifts continually. Numerous sand-bars appear in the channel at low stages of the stream.

The south channel is straight for about 1500 feet above and 500 feet below the station. The left bank is comparatively low, wooded and will overflow at high stages. The right bank is higher, wooded and not liable to overflow. The bed of the stream is composed of sand and gravel and will shift.

The gauge in the north channel is a plain staff, graduated to feet and hundredths, spiked inside a stilling-box sunk in the bed of the stream at the right bank. The zero (elev., 74.37) is referred to a bench-mark (assumed elev., 100.00) on the top of the downstream end of the left abutment.

The gauge in the south channel is a plain staff graduated to feet and hundredths, spiked to the stream face of the cribbing around the right abutment at its upstream end. The zero (elev., 74.28) is referred to the bench-mark described above.

On November 16, 1911, the above gauges were replaced by chain gauges of the standard type, one in each channel. The gauge in the north channel is located on the floor of the bridge, near the left side of the centre span. The zero of the gauge (elev., 71.87) is referred to the same bench-mark as the staffs. The gauge in the south channel is located on the floor of the bridge at the centre of the right span. The zero of this gauge (elev., 71.02) is also referred to the bench-mark described above.

The gauges were read once each day by George Bond, of Battleford, who lives within half a mile of the bridge on the north side of the river. In his absence the readings were taken by Robert Campbell, who is in the employ of Mr. Bond.

As only a few discharge measurements were made during 1911, there are not sufficient data to make accurate estimates of the daily discharge. Tables of daily gauge-height, daily discharge and monthly discharge for 1911 will be prepared during 1912 and published with the records for that year.

DISCHARGE MEASUREMENTS OF NORTH SASKATCHEWAN RIVER AT BATTLEFORD, SASK., in 1911.

Date	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
April 3.....	W. H. Greene...	624	1,848	1 29		2,395
May 18.....	H. R. Carscallen.....	606	1,807.5	1 83	1 60	3,317
May 19.....	do	324	2,156	2 63	1.405	5,665
May 18, 19.....	do	930	3,963			8,982
June 15.....	do	805 5	2,539	2 10	2 23	5,322
June 16.....	do	457 2	3,059	2 46	2 28	7,540
June 15, 16.....	do	12,627	5,598			12,862
July 14, 15.....	do	10,778	4,924	2 69	4 41	13,248
July 17, 18.....	do	4,999	4,174	2 56	3 67	10,673
July 14-18	do	15,777	9,098			23,922
Aug. 9, 10.....	J. C. Keith.....	1,076 6	4,531	2 59	4 07	11,776
Aug. 10, 11.....	do	509 2	4,639	2 55	4 186	11,851
Aug. 9-11.....	do	1,585 8	9,170			23,627
Sept. 25.....	do	807 0	2,065	2 07	1 98	4,099
Sept. 26.....	do	442 5	2,632	2 29	1 83	6,026
Sept. 25, 26	do	1,249 5	4,697			10,125
Nov. 13, 14.....	do		1,078	1 17	3 21	1,266
Nov. 15, 16.....	do		560.9	1 21	3 00	679
Nov. 13-16.....	do		1,639			1,945
Dec. 7, 8.....	do		511	1.45	3.52	738
Dec. 8, 9.....	do		1,085	1 83	4 065	1,988
Dec. 7-9.....	do		1,596			2,726

N.B. —Measurements on and after Nov. 13 were made under ice conditions.

NORTH SASKATCHEWAN RIVER AT EDMONTON, ALTA.

This station is located at the low-level traffic and railway bridge in the city of Edmonton, on the N.W. quarter Sec. 33, Tp. 52, Rge. 24, W. 4th Mer. The bridge is a four-span steel structure supported by concrete piers and abutments. Between the right pier and the shore, and extending for some distance above and below the bridge, there is a row of timber piers with a long string of booms anchored to them. This boom is for the purpose of conducting logs to the Edmonton Lumber Company's mill, a short distance below the bridge. The boom is sometimes full of logs and at such times it becomes very hard to obtain velocity observations in this span.

The channel is straight for about 700 feet above and 200 feet below the station. Both banks are high, of an earth formation and sparsely covered with brush. The bed of the stream is composed of sand and gravel, and is liable to shift. The three piers of the bridge divide the stream into four channels.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the stream face of the left or north abutment and is suitably marked on the hand-rail of the bridge.

There are two gauges at this station known as (1) the high-level gauge and (2) the low-level gauge. The high-level gauge is spiked perpendicularly to a high timber pier which is a short distance above the saw-mill, close to the right bank of the river and about 300 yards below the bridge. The gauge consists of two 1 in. x 6 in. x 12 ft. boards faced with tin, stencilled off into feet and tenths and is spiked to the pier in such a manner that the twelve-foot mark on the lower gauge coincides with the zero of the upper gauge. The low-level gauge is spiked to a low pier about 200 feet from the right bank and about 75 feet upstream from the pier to which the high-level gauge is attached. This gauge consists of one 1 in. x 6 in. x 108 board marked in the same way as the high-level gauge. Both gauges are referred to a bench-mark on the downstream face of the left abutment of the bridge marked "D.P.W." This bench-mark was established by the River Surveys Branch of the Department of Public Works, and their elevation for it is 2025.00 feet above mean sea-level. The elevation of the datum of the high-level gauge is 1995.668 feet; that of the low-level gauge is 1991.728 feet.

This station was first made use of by this survey during the season of 1911. The gauge was read twice daily by an employee of the Edmonton Lumber Company, and the observations were supplied to this office by that Company, but, as only a few discharge measurements were made, there is not sufficient data to compute daily and monthly discharges. The records for this station for 1911 will be completed during 1912 and published with the records for that year.

DISCHARGE MEASUREMENTS OF NORTH SASKATCHEWAN RIVER AT EDMONTON, ALTA., in 1911.

Date	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
Mar. 22, 23.....	W. H. Greene.....	400.1	1,500	1.518	None.	2,278
May 11, 12.....	H. R. Carscallen.....	431.6	3,628.5	2.61	6.89	9,465
June 12, 13.....	do.....	504.6	3,940.2	2.93	7.61	11,550
July 12, 13.....	do.....	578.0	5,790.2	3.52	10.34	20,402
Aug. 4 and 5.....	J. C. Keith.....	577.9	5,639.0	3.67	10.33	20,720
Sept. 19 and 20.....	do.....	542.3	3,908.5	2.44	7.32	9,534
Dec. 22, 26.....	do.....	...	1,418.4	1.09	3.67	1,540†
Dec. 29, 30.....	do.....	...	1,606	1.04	3.81	1,699†

Note: —Gauge-heights referred to high-water gauge.

Zero of datum, 1995.668.

†Ice Conditions.

BATTLE RIVER AT BATTLEFORD, SASK.

This station was established June 17, 1911, by H. R. Carscallen. It is located at the traffic bridge about one and one-quarter miles south of the town of Battleford on the S.E. quarter Sec. 19, Tp. 43, Rge. 16, W. 3rd Mer. The station is about three miles above the junction of the Battle River with the North Saskatchewan River. Owing to the station being so close to the mouth of the river, extreme high water in the North Saskatchewan River may cause water to back up on this gauge.

Discharge measurements are made from the downstream side of the bridge which is a three-span steel structure supported by concrete piers and abutments. Remains of old timber piers close to the new ones affect velocity observations in their vicinity. The initial point for soundings is a mark on the hand-rail opposite the stream face of the left abutment.

The channel is straight for about 300 yards above and one-half mile below the station. Both banks are high, sandy and clear of brush. Both banks are riprapped with boulders near each abutment. The bed is sandy and liable to shift.

SESSIONAL PAPER No. 25d

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to the downstream face of a short pile near the right bank and about forty feet upstream from the bridge. The zero (elev., 71.95) is referred to a bench-mark (assumed elev., 100.00) on the top of the downstream corner of the left abutment.

During 1911, the gauge was read once daily by C. J. Johnson, who lives within 200 yards of the bridge.

As only a few discharge measurements were made during 1911, there are not sufficient data to make accurate estimates of the daily discharge, tables of daily gauge-height, daily discharge and monthly discharge for 1911 will be prepared during 1912 and published with the records for that year.

DISCHARGE MEASUREMENTS OF BATTLE RIVER AT BATTLEFORD, SASK., in 1911.

Date	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
May 20.....	H. R. Carscallen.....	100.5	295.12	1.642		484.70
June 17.....	do.....	153.3	237.26	1.38	4.00	327.67
July 18.....	do.....	170.3	495.16	1.85	5.05	751.13
Aug. 12.....	J. C. Keith.....	187.2	478.98	2.13	5.55	1022.85
Sept. 27.....	do.....	165.0	375.45	2.09	5.14	784.64

MISCELLANEOUS DISCHARGE MEASUREMENTS IN NORTH SASKATCHEWAN RIVER DRAINAGE BASIN, in 1911.

DATE.	Hydrographer	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. Feet</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
Oct. 20.....	P. J. Jennings...	Ribstone Creek....	N.W. 35-43-4-4.	20.0	15.4	0.90	11.08x

x Slope measurement.

SOUTH SASKATCHEWAN RIVER DRAINAGE BASIN

General Description.

The upper portion of this drainage basin will be dealt with in the descriptions of the drainage basins of the Bow, Little Bow, Oldman, Waterton, Belly and St. Mary rivers. These streams are all conjoined at a point known as the Grand Forks, to form the South Saskatchewan River. From the Grand Forks the river flows in a north and easterly direction to its junction with the North Saskatchewan river a short distance east of the city of Prince Albert. From this point onward the stream takes the name of the Saskatchewan River.

After the confluence of the Bow and Belly rivers the stream receives comparatively little drainage, the principal tributaries being the Red Deer river, draining that portion of the basin between the North and the South Saskatchewan river, and Sevenpersons river and Swift-current creek emptying into the main stream from the south. Descriptions of the drainage basins of all these streams are given elsewhere in this report.

The drainage basin of this stream is quite similar to that of all such streams as have their source in the mountains and flow across the prairies. The upper part of the basin has a good fall, with rock and gravel formation and a good growth of timber. In contrast to this, the prairie section of the basin is sparsely wooded, except along the banks of the stream, the rock formation changes to earth and the stream is more apt to change its channel, especially in times of flood. The high water, futhermore, occurs in the hot months of summer and is caused by the melting of the snow-fields in the mountains. In consequence, the low water occurs in the winter months, when there is no melting snow to augment the stream flow.

In addition to the gauging station on the tributaries, which are taken up in detail elsewhere in this report, there were two stations established on the main stream during the season of 1911, and daily gauge-height observations and discharge measurements at regular intervals were taken at these stations. These stations are located at the cities of Medicine Hat and Saskatoon.

SOUTH SASKATCHEWAN RIVER AT SASKATOON, SASK.

This station was established May 27, 1911, by H. R. Carscallen. It is located at the Canadian Northern Railway bridge in the city of Saskatoon, on the S.W. quarter Sec. 28, Tp. 36, Rge. 5, W. 3rd. Mer.

The bridge is a six-span timber structure supported by cement piers and abutments. It was originally set upon timber piers and abutments. Parts of these old piers still remain in the stream close to the new cement ones, and affect velocity observations in their vicinity. There is a foot-bridge on the downstream side of the bridge which facilitates gauging. Discharge measurements are made from the downstream side.

The channel is straight for about 500 feet above and 800 feet below the station. Both banks are high and sandy. The right bank is covered with a dense growth of trees and brush above and below the station. The left bank is clear of brush. The bed of the stream is sandy and shifts.

The gauge is a plain staff, graduated to feet and hundredths, spiked to a pile at the left side of the old timber pier near the left bank of the river. The zero (elev., 63.80) is referred to a bench-mark (assumed elev., 100.00) on the top of the downstream end of the left abutment.

The gauge was read once each day by N. M. McDonald, a book-keeper, living within 200 yards of the bridge.

As only a few discharge measurements were made during 1911, there are not sufficient data to make accurate estimates of the daily discharge. Tables of daily gauge-height, daily discharge and monthly discharge for 1911 will be prepared during 1912 and published with the records for that year.

DISCHARGE MEASUREMENTS OF SOUTH SASKATCHEWAN RIVER, AT SASKATOON, in 1911.

Date	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
May 27.....	H. R. Carscallen.....	744.2	5,916	4.48	5.30	26,535
June 20.....	do	788.7	7,688	5.34	7.39	41,054
July 20, 21.....	do	716.7	5,451	3.88	4.66	21,192
Aug. 16, 17.....	J. C. Keith.....	795.7	7,830	5.38	7.75	42,162
Sept. 28, 29.....	do	640.8	4,317	3.24	3.15	13,953
Nov. 22.....	do .....	...	2,095	1.40	2.772	2,942†
Dec. 12, 13.....	do .....	...	2,098	2.19	3.44	4,598†

† Ice Conditions.

SOUTH SASKATCHEWAN RIVER AT MEDICINE HAT, ALTA.

This station was established May 31, 1911, by H. R. Carscallen. It is located at the traffic bridge in the city of Medicine Hat on the N.W. quarter Sec. 31, Tp. 12, Rge. 5, W. 4th Mer.

The bridge is a five-span structure supported by concrete abutments and piers. Discharge measurements are made from the downstream side. The initial point for soundings is the stream face of the left, or west, abutment and is suitably marked on the hand-rail of the bridge.

The channel is straight for about 600 yards above and below the station. The current is moderate and uniform, except in the vicinity of the piers. At these points eddies, and, in some cases, stretches of backwater occur, making it difficult to obtain the mean velocity. The banks are high and sandy and clear of undergrowth. The bed is composed of sand and gravel and is liable to shift at high stages of the stream.

There are two gauges, graduated to feet and hundredths, fixed to the upper pier of the swing span of the C.P.R. bridge about 200 yards below the traffic bridge. The gauges are spiked to the shore face of the pier and are so placed that the datum of the lower gauge is exactly five feet below the datum of the higher gauge. The gauges are referred to a bench-mark (assumed elev., 100.00) on top of the downstream end of the left, or west, abutment of the traffic bridge. The elevation of the datum of the lower gauge is 64.85; that of the upper gauge 69.85.

The gauge was read once daily during the summer by John M. Fleager, a blacksmith, working within fifty feet of the bridge. The observations during the frozen season were made by Alfred Webber.

As only a few discharge measurements were made during 1911, there are not sufficient data to make accurate estimates of the daily discharge. Tables of daily gauge-height, daily discharge and monthly discharge for 1911 will be prepared during 1912 and published with the records for that year.

SESSIONAL PAPER No. 25d

DISCHARGE MEASUREMENTS OF SOUTH SASKATCHEWAN RIVER AT MEDICINE HAT, ALTA.,
in 1911.

Date	Hydrographer.	Width	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Feb. 25.....	H. R. Carscallen.....	314.4	2,046	0.77		1,574
May 31.....	do	643.3	4,969	2.94	5.11	14,629
June 26.....	do	782.6	6,870	4.27	8.35	29,343
July 25.....	do	621.2	4,822	2.76	4.97	13,322*
Sept. 9.....	J. C. Keith.....	773.4	6,649	4.04	7.72	26,899†
Oct. 31.....	do	475.7	3,198	1.46	2.48	4,660†

* New gauge established.

† New gauge placed.

MISCELLANEOUS DISCHARGE MEASUREMENT South Saskatchewan River in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet</i>	<i>Sq. Feet</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
Mar. 11-12 & 13.	W. H. Greene...	S. Saskatchewan River (near Bow Island).....	Sec. 15-11-11-4	671.80	1737.71	1.43	2477.17

RED DEER RIVER DRAINAGE BASIN

General Description.

The Red Deer River rises in the Sawback range of the Rockies, in the northern portion of the Rocky Mountain Park, near the boundary between the provinces of Alberta and British Columbia. It flows eastward for about forty miles, then northeastward for seventy or eighty miles to a point near Red Deer, Alberta. From here the river flows in a southeasterly and easterly direction to its junction with the South Saskatchewan river, just east of the fourth meridian, in Tp. 22, Rge. 28, W. 3rd Mer. It has a length of approximately 400 miles.

The valley of the Red Deer is wide and deep, the banks being very rough and cut up with a large number of deep coulees, draining into the river. Near its source the basin is well timbered and a good growth of timber is found along its banks for some distance out into the prairie. Seams of coal, well suited for domestic use, are found in the valley and form the principal source of fuel supply for the settlers along the stream in the prairie section.

The river carries a considerable supply of water at all times of the year, but the volume is subject to sudden variations, due to the melting of snow in the mountains and heavy summer rains.

Of the tributaries of the Red Deer, the most important are Panther river near its head, Little Red Deer river entering in Tp. 36, Rge. 1, W. 5th Mer., and Rosebud river emptying into it in Tp. 28, Rge. 19, W. 4th Mer. In addition there are innumerable small streams draining into the main river in the western portion of the basin. From the mouth of the Rosebud River eastward there is very little drainage into the river.

Irrigation on the Red Deer and its branches is practically unknown. There are only a few small schemes on some of the smaller tributaries. The land along the valley, though lacking moisture, is extremely fertile, and with the help of irrigation much of it might be cultivated and fine crops produced. The irrigation of the bench-land from the river would be difficult on account of the small fall in the river, the depth of the valley, and the rolling nature of the lands in the drainage basin.

Very little hydrographic work has been done in this basin as yet. A gauging station was established on the Red Deer river near Innisfail, in 1910, but an observer could not be secured and only periodic discharge measurements have been secured at this station. In the fall of 1911, another gauging station was established at the town of Red Deer. It is expected that continuous records will be obtained at this point.

Of the tributaries of Red Deer river, Berry and Blood Indian creeks are the only ones that have been given any attention. These small creeks, which drain into the river in the prairie section, have a few small irrigation rights registered against them, and gauging stations were established on them in 1911.

RED DEER RIVER NEAR INNISFAIL, ALTA.

This station was established Sept. 28, 1910, by H. R. Carscallen. It is located at the traffic bridge on the N.E. quarter Sec. 6, Tp. 36, Rge. 28, W. 4th Mer. The bridge is about four miles north-west of Innisfail. It is a three-span steel structure supported by timber, rock-filled piers and abutments, with a short approach at the south end of the bridge.

The channel is straight for about 600 yards above the station. An island divides the stream into two channels, and extends to within about 300 yards of the station. The channel is straight for about 400 yards downstream. The current is moderate over most of the cross-section, although fairly swift in the right channel. The current is moderate upstream becoming more swift below the station.

The right bank is high and sandy. The left bank is comparatively low and may overflow at very high stages of the stream. Both banks are covered with a dense growth of timber and brush. The bed of the stream is composed of sand and gravel. There is a gravel bar between the two centre piers, and in low water there is no flow in this channel. At high-water stages of the stream there are three channels, caused by the piers of the bridge.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the right face of the left abutment, and distances are marked with red paint every five feet along the bottom chord of the bridge.

The gauge which is a plain staff graduated to feet and hundredths, is spiked to the right abutment on the downstream side of the bridge. It is referred to bench-marks as follows: (1) three spike heads in the cribbing of the right abutment (elevation, 14.25 ; (2) two spikes in side of large poplar tree on right bank about fifty feet below the bridge; (elevation, 12.50).

Arrangements were made with Mr. F. F. Malcolm, a building contractor living within 300 yards of the bridge, to take daily gauge-height observations. Mr. Malcolm, was, however, away from home so much he was unable to take any records, and as no other observer is at present available at this point a new station was established in the town of Red Deer in the fall of 1911.

DISCHARGE MEASUREMENTS OF RED DEER RIVER AT INNISFAIL, ALTA., in 1911.

Date	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 9	H. R. Carscallen	303.6	696.59	2.94	1.50	2,045.93
June 9	do	342.0	1,138.54	4.70	2.775	5,347.90
July 10	do	325.5	947.26	4.53	2.32	4,293.34
Aug. 2	J. C. Keith	341.0	841.35	3.77	1.97	3,168.79
Sept. 15	do	342.0	875.72	2.61	1.70	2,270.11

RED DEER RIVER AT RED DEER, ALTA.

This station was established on December 2, 1911, by J. E. Degnan. It is located on the S. E. quarter Sec. 20, Tp. 38, Rge. 27, W. 4th Mer., at the traffic bridge in the town of Red Deer.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to the downstream face of the cribbing around the center pier. It is referred to the top of a pile on the right bank (elev., 15.50 feet above the datum of the gauge).

The stream flows in one channel, which is straight for about 600 feet above and 1300 feet below the gauge. The right bank may overflow in very high stages of the stream. The left bank is high and cannot overflow. The bed of the stream is composed of gravel, but is not liable to shift.

Discharge measurements are made from the downstream side of the bridge during open water. The initial point for soundings is a point near the north end of the bridge and is marked on the hand-rail of the bridge.

The gauge is read by Mr. Leo B. Brown.

As only two discharge measurements were made, there are not sufficient data to compute daily discharges. The tables of daily and monthly discharges for December, 1911, will be completed during 1912 and published with the records for that year.

DISCHARGE MEASUREMENTS OF RED DEER RIVER AT RED DEER, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Dec. 2	J. E. Degnan	309.5	438.31	1.455	4.11	637.95
Dec. 14 and 15	do	240.65	404.67	1.34	4.105	544.64

SESSIONAL PAPER No. 25d

BERRY CREEK AT FORSTER'S RANCHE, ALTA.

This station was established on May 30, 1911, by R. T. Sailman. It is located on the N.E. quarter Sec. 21, Tp. 23, Rge. 13. W. 4th Mer., about ten miles east of the village of Hutton.

The channel is straight for 100 feet above and 30 feet below the station. The right bank is low, covered with scrub and will overflow in high water, the left bank is high and sparsely covered with brush. The bed of the stream is soft and may shift in high stages. The current is sluggish.

Discharge measurements are made at a wading section some distance downstream from the gauge.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post driven into the bed of the stream at the right bank. It is referred to a bench-mark on a nail in the side of a tree on the right bank near the gauge (elevation, 5.37 feet above the zero of the gauge).

The gauge was read once each day by Miss L. Forster.

DISCHARGE MEASUREMENTS OF BERRY CREEK AT FORSTER'S RANCHE, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 30.....	R. T. Sailman....	15.0	4.51	0.52	1.56	2.34
June 23.....	do	8.4	1.66	0.32	1.46	0.54
July 29.....	L. R. Brereton	19.0	12.4	1.36	2.16	16.8
Sept. 7.....	do	17.5	7.56	0.64	1.79	4.84
Oct. 13.....	do	13.5	4.40	0.70	1.67	3.08

DAILY GAUGE-HEIGHT AND DISCHARGE OF BERRY CREEK AT FORSTER'S RANCHE, ALTA., for 1911.

DAY.	June.		July.		August.		September.		October.	
	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			5.39	290	2.14	16	1.85	7.0	1.70	3.7
2.....			5.34	280	2.13	16	1.85	7.0	1.70	3.7
3.....			5.15	246	2.13	16	1.85	7.0	1.69	3.6
4.....			4.82	202	2.13	16	1.85	7.0	1.69	3.6
5.....			4.18	137	2.12	15	1.84	6.7	1.68	3.4
6.....			3.70	100	2.12	15	1.84	6.7	1.67	3.2
7.....			3.42	81	2.11	15	1.81	6.0	1.67	3.2
8.....			3.32	75	2.11	15	1.79	5.5	1.67	3.2
9.....			3.24	70	2.11	15	1.78	5.3	1.67	3.2
10.....			3.18	67	2.10	15	1.77	5.1	1.67	3.2
11.....			2.98	55	2.10	15	1.76	4.9	1.66	3.1
12.....			2.86	48	2.09	14	1.76	4.9	1.66	3.1
13.....			2.81	46	2.08	14	1.76	4.9	1.66	3.1
14.....			2.78	44	2.06	13	1.75	4.7	1.66	3.1
15.....			2.74	42	2.05	13	1.75	4.7	1.66	3.1
16.....			2.70	40	2.05	13	1.74	4.5	1.66	3.1
17.....			2.66	38	2.02	12	1.74	4.5	1.65	3.0
18.....			2.58	34	1.95	9.8	1.74	4.5	1.65	3.0
19.....			2.51	30	1.95	9.8	1.74	4.5	1.65	3.0
20.....			2.46	28	1.95	9.8	1.73	4.3	1.64	2.8
21.....			2.42	27	1.94	9.5	1.73	4.3	1.63	2.6
22.....			2.37	25	1.93	9.2	1.73	4.3	1.63	2.6
23.....	1.46	0.7	2.33	23	1.93	9.2	1.73	4.3	1.62	2.5
24.....	1.62	2.5	2.29	22	1.92	8.9	1.72	4.1	1.61	2.4
25.....	1.76	4.9	2.26	20	1.92	8.9	1.72	4.1	1.60	2.2
26.....	*		2.25	20	1.91	8.6	1.72	4.1		
27.....	*		2.24	20	1.90	8.3	1.72	4.1		
28.....	*		2.21	19	1.89	8.0	1.72	4.1		
29.....	*		2.17	17	1.88	7.8	1.71	3.9		
30.....	*		2.16	17	1.87	7.5	1.70	3.7		
31.....			2.15	16	1.86	7.3				

* Above top of gauge.

NOTE:—Daily discharges for gauge-heights above 2.50 are only approximate.

MONTHLY DISCHARGE OF BERRY CREEK AT FORSTER'S RANCHE, ALTA., for 1911.

(Drainage area, 1060 square miles.)

MONTH.	DISCHARGE IN SECOND FEET				RUN-OFF	
	MAXIMUM	MINIMUM	Mean.	Per square mile.	Depth in inches on Drainage area	Total in acre-feet.
June (23-25)	4.9	0.7	2.7	0.002	0.00	16
July.....	290.0	16.0	70.3	0.066	0.08	4,323
August	16.0	7.3	12.0	0.011	0.01	738
September	7.0	3.7	5.02	0.005	0.01	299
October (1-25)	3.7	2.2	3.07	0.003	0.00	152
The Period.....					0.10	5,528

BLOOD INDIAN CREEK AT HALLAM'S RANCHE, ALTA.

This station was established on June 26, 1911, by R. T. Sailman. It is located on the S.W. ¼ Sec. 10, Tp. 23, Reg. 8, W. 4th Mer., about one and one half miles above J. R. Hallam's house and 800 feet downstream from his irrigation dam.

The channel is straight for fifty feet above and forty feet below the station. Both banks are high, fairly clear of brush and of clay formation. The bed of the stream is soft, with considerable vegetation and may shift in high stages. The current is sluggish.

Discharge measurements are made a short distance downstream from the station by wading, a weir being used at low stages of the stream.

The gauge which is a plain staff graduated to feet and hundredths, is spiked to a post sunk in the bed of the stream at the left bank and securely stayed to the bank. It is referred to a bench-mark on a large stone 107 feet northeast of the gauge (elevation, 9.00 feet above the zero of the gauge).

The gauge was read once each day by J. R. Hallam.

DISCHARGE MEASUREMENTS OF BLOOD INDIAN CREEK AT HALLAM'S RANCHE, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. Ft.	Ft. per sec.	Feet.	Sec.-ft.
June 26.....	R. T. Sailman.....	3.8	1.49	0.58		0.87
June 26.....	do	8.5	1.71	0.88	2.25	1.51
Aug. 9	L. R. Brereton	7.2	1.92	0.72	2.20	1.39
Sept. 8	do	7.0	1.48	0.63	2.18	0.93
Oct. 16.....	do	6.3	1.33	0.75	2.18	1.00



Lake Louise and Victoria Glacier looking from Lake Louise Chalet. Taken by P. M. Sauder.



A Small Lake near Laggan where Nature Multiplies her Charms, looking southwest to Victoria Glacier, four miles away. Taken by P. M. Sauder.

DAILY GAUGE HEIGHT AND DISCHARGE of Blood Indian Creek at Hallam's Ranche, Alta., for 1911.

DAY.	June.		July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2 39	3 4	2 18	1 0	2 16	0 9	2 18	1 0	2.18	1.0
2.....	2 29	1 9	2 18	1 0	2 16	0 9	2 18	1 0	2.18	1.0
3.....	2 28	1 8	2 17	0.9	2 16	0 9	2 18	1 0	2.18	1.0
4.....	2 35	2 6	2 17	0.9	2 16	0 9	2 18	1 0	2.18	1.0
5.....	2 34	2 5	2 18	1 0	2 18	1 0	2 18	1 0	2.18	1.0
6.....	2 30	2 0	2 20	1 1	2 18	1 0	2 18	1 0	2.18	1 0
7.....	2 30	2 0	2 20	1.1	2 18	1 0	2 18	1 0	2.18	1.0
8.....	2 34	2 5	2 19	1 0	2 18	1 0	2 18	1 0	2.19	1.0
9.....	2 35	2 6	2 18	1 0	2 18	1 0	2 18	1 0	2.19	1.0
10.....	2 39	3 4	2 18	1 0	2 18	1 0	2 18	1 0	2.19	1.0
11.....	2 30	2 0	2 18	1 0	2 18	1 0	2 18	1 0	†2.19	1.0
12.....	2 35	2 6	2 17	0 9	2 18	1 0	2 18	1 0	2 20	1.1
13.....	2 35	2 6	2 17	0 9	2 18	1 0	2 18	1 0	2.23	1.3
14.....	2 36	2 8	2 17	0 9	2 18	1 0	2 18	1 0	2.23	1.3
15.....	2 36	2 8	2 17	0 9	2 18	1 0	2 18	1 0	2.30	2 0
16.....	2 39	3 4	2 17	0 9	2 18	1 0	2 18	1 0	.....	.....
17.....	2 39	3 4	2 16	0 9	2 18	1 0	2 18	1 0	.....	.....
18.....	2 28	1 8	2 16	0 9	2 18	1 0	2 18	1 0	.....	.....
19.....	2 28	1 8	2 16	0 9	2 18	1 0	2 18	1 0	.....	.....
20.....	2 20	1 1	2 16	0 9	2 18	1 0	2 18	1 0	.....	.....
21.....	2 20	1 1	2 15	0 8	2 18	1 0	2 18	1 0	.....	.....
22.....	2 19	1 0	2 15	0 8	2 18	1 0	2 18	1 0	.....	.....
23.....	2 19	1 0	2 17	0 9	2 18	1 0	2 18	1 0	.....	.....
24.....	2 19	1 0	2 17	0 9	2 18	1 0	2 18	1 0	.....	.....
25.....	2 19	1 0	2 16	0 9	2 18	1 0	2 18	1 0	.....	.....
26.....	2.25	1.5	2 19	1 0	2 15	0 8	2 18	1 0	2 18	1 0	.....	.....
27.....	2 12	2.3	2 19	1 0	2 18	1 0	2 18	1 0	2 18	1 0	.....	.....
28.....	2 29	1.9	2 19	1 0	2 18	1 0	2 18	1 0	2 18	1 0	.....	.....
29.....	2.26	1.6	2 19	1 0	2 17	0 9	2 18	1 0	2 18	1 0	.....	.....
30.....	2 21	1.2	2 19	1 0	2 17	0 9	2 18	1 0	2 18	1 0	.....	.....
31.....	2.18	1 0	2.16	0.9	.....	.....	2 18	1 0	.....	.....

†No observation, gauge height interpolated.
NOTE:—Data insufficient for computation of discharges corresponding to gauge heights over 2.30.

MONTHLY DISCHARGE OF BLOOD INDIAN CREEK AT HALLAM'S RANCHE, ALTA., for 1911.
(Drainage area, 322 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET				RUN-OFF.	
	Maximum	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
June (26-30).....	2.3	1.2	1.70	0.005	0.001	17
July.....	3.4	1.0	1.94	0.006	0.006	119
August.....	1.1	.8	0.932	0 003	0.003	57
September.....	1.0	.9	0.987	0.003	0.003	59
October.....	1.0	1.0	1 0	0.003	0.003	61
November (1-15).....	2.0	1.0	1.11	0 003	0.002	33
The period.....						346

MISCELLANEOUS DISCHARGE MEASUREMENTS IN RED DEER RIVER Drainage Basin, in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet	Sq. feet	Ft. per sec.	Sec. feet
July 29.....	L. R. Brereton..	Bullpound Creek..	N.W. 9-25-14-4.	20.5	12.41	0.40	4.95
Sept. 7.....	do	do	N.E. 25-24-15-4	9.9	2.42	0.77	1.86
Oct. 12.....	do	do	do	No Flow.	water in pools.		
Aug. 3.....	J. C. Keith	Blindman River...	Sec. 15-39-27-4..	98.0	352.90	0.78	278.
Sept. 18.....	do	do	do	96.0	330.30	0.745	246.05
July 31.....	L. R. Brereton..	Dead Fish Creek....	N.E. 21-23-13-4	1.0	0.10	0.40	0.04
Sept. 7.....	do	do	do	1.0			nil.
Oct. 13.....	do	do	do	1.50	0.16	0.38	0.06
July 31.....	do	Est Br. Berry Crk	Sec. 35-22-12-4				Dry.
Sept. 8.....	do	do	do				Dry.
Oct. 14.....	do	do	do	No flow.	water in pools.		

BOW RIVER DRAINAGE BASIN.

General Description

The Bow River heads in lakes Bow and Hector, which lie north of the Canadian Pacific Rail-way and just east of the Great Divide, in the Rocky Mountain Park, whose elevations are 6420 and 5694 feet, respectively, above mean sea-level. The river flows in a southeasterly direction to the city of Calgary, where it takes a big bend to the south, then continues in a southeasterly course to its junction with Belly River at the Grand Forks. From the confluence of these two streams it is known as the South Saskatchewan River.

The Bow River has a large number of streams draining into it in the western portion of the basin, Of these, the principal tributaries are Cascade and Ghost rivers, draining the northern portion of the basin, and Spray, Kananaskis, Elbow, Sheep and Highwood rivers, draining the southern portion. Beyond the mouth of Highwood river very little drainage reaches Bow river and, in consequence, the stream depends for its supply almost wholly upon the run-off from the mountains and foothills. As a result, Bow River possesses a normally steady flow throughout the year, but is subject to sudden freshets caused by melting snow and heavy rains in the moun-tains. The minimum flow, therefore, occurs in the frozen season, when there is little run-off from the snow fields in the western part of the drainage basin.

The valley of the Bow is deep and well defined throughout its course. In the mountain section it is, naturally, comparatively narrow and very heavily timbered, and the stream flows over a stony bed and between high rocky banks. The nature of the valley changes gradually until, when it reaches the prairie, it is wide, of a clay formation and devoid of trees and the stream flows over a bed consisting mainly of gravel and sand. The water is clear and pure.

Considerable water is being diverted from Bow River for irrigation purposes and more will be used in the near future. The Natural Resources Branch of the Canadian Pacific Railway are preparing to irrigate about 3,000,000 acres of land lying north of their main line and between Calgary and the eastern boundary of Range 11, W. 4th Mer. The water is being diverted about two miles east of Calgary and also at Bassano. The western section of the tract is now supplied with water and the works to supply the Central and Eastern sections are being rushed to com-pletion. The Southern Alberta Land Company has been granted water rights and works are being constructed to irrigate about 380,000 acres of land lying to the west of Medicine Hat. The head-gates of their canal and their reservoir are near Gleichen. In addition to these large projects, there are a number of small schemes on Highwood and Sheep rivers and their branches.

Many favourable sites for power development are located on the Bow and its tributaries, but up to the present only one of any importance has been developed. This belongs to the Calgary Power and Transmission Company, and is for the purpose of supplying Calgary with electric power. Their dam and power-house is just below Kananaskis falls, their transmission line running a distance of fifty miles to Calgary. At present only 12,000 horse-power is to be developed, but ultimately this will be raised to 30,000 horse-power, their power plant being designed to accommodate this increase.

In addition to these projects the city of Calgary draws its domestic water-supply from Elbow River. The intake is about twelve miles southwest of Calgary, above which point the course of the river is through a wild and unsettled country, thus insuring the purity of the water-supply.

BOW RIVER AT LAGGAN, ALTA.

This station was established on July 18, 1910, by J.C. Keith. It was at first located at an old traffic bridge on the N.E ¼ Sec. 28, Tp. 28, Rge. 16, W. 5th Mer., about one third of a mile west of Laggan. This site did not prove satisfactory, and a cable station was, therefore, estab-

SESSIONAL PAPER No. 25d

lished by H. C. Ritchie near the east boundary of the S. E. 1⁴ Sec. 28, Tp. 28, Rge. 16, W. 5th Mer., on August 30, 1911. The new station is about half a mile southeast of Laggan and about 300 feet above the mouth of Pipestone river.

The river flows in one channel at all stages. It is straight for 75 feet above and 200 feet below the station. Both banks are high and not liable to overflow. The right bank is covered with a good growth of spruce, but the left is almost clear. The bed of the stream is composed of gravel and boulders, but is not liable to shift. The current has a good velocity.

Discharge measurements are made by means of a cable, car, tagged wire and stay wire. The initial point for soundings is the centre of the tower on the left bank, and distances are marked on the measuring wire by tags at every five feet.

The gauge, which is of the standard chain type, is situated at the left bank, about 8 feet downstream from the cable. The zero (elev., 89.14) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated about 11 feet southeast of the cable tower on the left bank.

Arrangements were made to secure records at this station continuously during the whole year, but an ice-jam formed a short distance below the station causing back-water on the gauge, and made it impossible to compute the daily discharge after November 9th.

During 1911, the gauge was read from January 1 to April 30 by W. F. Fraser, from May 1 to October 15 by F. A. Kerr, and from October 16 to the end of the year by E. Braund.

DISCHARGE MEASUREMENTS OF BOW RIVER AT LAGGAN, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
Jan. 30 . . .	H. R. Carscallen.	40.5	55 9	1 49	2.68	83.2x
Feb. 13. . . .	do	35.5	45 1	1 10	1.94	49.4x
Mar. 6	do	35.5	36 8	1.48	1.30	51.4x
Mar. 23. . . .	do	42	45 2	1 41	1.02	63.7z
Apr. 7.	H. C. Ritchie	43.5	53 4	1 52	1.04	81.1x
Apr. 27.	do	43.5	58 8	1 88	1.25	110 7x
May 11.	do	62.5	93 4	2 85	1 85	265.9x
June 1	B. Russell	103 8	184 6	3 50	2.47	647.6x
June 16.	do	111.8	310 6	5 77	3.32	1793.0x
July 1.	do	110.0	277 6	5 71	3.17	1585.0x
July 14	do	86.3	232 8	4 54	2.84	1058 0x
July 27.	H. C. Ritchie	111.5	259 6	5 24	3.11	1360.0x
Aug. 18.	H. Brown	108.3	200 0	3 99	2 59	798.7x
Sept. 5.	do	69 5	157 9	4 90	6 38	774.2*
Sept. 21.	do	61.5	98 3	3 43	5.48	336.7*
Oct. 17.	V. A. Newhall	47 7	46 1	2 79	4.64	128.5*
Nov. 2.	do	34.5	29 0	1 95	4.37	56.8*
Nov. 20. . . .	do	61 5	289 5	0 23	†	65 5*†
Dec. 4.	do	61	196 0	0 62	†	121.7*▲
Dec. 6.	do	42	38 2	1 65	†	63.2■
Dec. 18. . . .	do	45	42 2	1 43	†	60 2■

xDischarge measured at old station. *Discharge measured at new station.
†Gauge not read owing to backwater caused by ice jam. ‡May be slightly inaccurate owing to slush ice.
▲Accuracy affected by great amount of frozen slush ice causing cross-currents.
■Gauging made at an open water section west of Laggan. Probable error small.

DAILY GAUGE-HEIGHT AND DISCHARGE OF BOW RIVER AT LAGGAN, ALTA., for 1911.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1 65	114	2 65	80	1 85	53	1 10	90	1 33	125	2 42	617
2.....	1 90	130	2 65	80	1 80	53	1 08	87 6	1 35	129	2 66	850
3.....	2 80	210	2 75	90	1 40	46	1 05	84	1 53	167	2 82	1,035
4.....	2 90	216	2 70	85	1 38	48	1 05	84	1 60	185	2 80	1,010
5.....	3 00	216	2 65	80	1 30	48	1 05	84	1 75	230	2 63	818
6.....	2 85	195	2 65	80	1 25	48	1 05	84	1 85	266	2 64	828
7.....	2 35	140	2 40	65	1 15	48	1 10	90	1 80	247	2 65	839
8.....	2 35	135	2 20	57	1 10	48	1 20	103	1 78	240	2 60	786
9.....	2 50	140	2 10	53	1 03	47	1 30	120	1 80	247	2 60	786
10.....	2 50	130	2 00	49	1 03	48	1 40	139	1 80	247	2 70	894
11.....	2 60	130	2 00	49	1 03	49	1 45	149	1 85	266	2 76	963
12.....	2 60	121	1 98	48 2	1 03	51	1 15	96	1 85	266	3 05	1,349
13.....	2 40	95	1 96	47 4	1 00	51	1 10	90	1 85	266	3 12	1,456
14.....	2 20	72	1 95	47	0 95	50	1 05	84	1 76	233	3 27	1,697
15.....	2 20	66	1 95	47	0 95	52	1 05	84	1 89	283	3 35	1,832
16.....	2 10	59	1 98	48 2	0 95	53	1 03	81 6	2 07	371	3 32	1,781
17.....	2 05	51	2 00	49	0 95	54	1 05	84	2 25	484	3 33	1,798
18.....	2 05	51	2 05	51	0 95	55	1 05	84	2 20	450	3 34	1,815
19.....	2 05	51	2 05	51	0 95	56	1 05	84	2 25	484	3 30	1,747
20.....	2 05	51	2 10	53	0 95	57	1 03	81 6	2 25	484	3 16	1,519
21.....	2 10	53	2 00	49	0 95	58	1 08	87 6	2 30	520	3 12	1,456
22.....	2 00	49	2 03	50 2	0 95	59	1 08	87 6	2 28	506	3 45	2,008
23.....	2 10	53	2 05	51	1 00	62	1 12	92 4	2 16	424	3 40	1,919
24.....	2 10	53	2 05	51	1 02	66	1 15	96	2 09	382	3 48	2,063
25.....	2 05	51	2 08	52 2	1 05	70	1 20	103	2 03	350	3 40	1,919
26.....	2 00	49	2 10	53	1 05	71	1 20	103	1 95	310	3 32	1,781
27.....	2 20	57	2 05	51	1 05	74	1 25	111	1 86	270	3 25	1,664
28.....	2 20	57	1 90	51	1 05	77	1 30	120	1 91	292	3 24	1,648
29.....	2 10	53	.....	.....	1 06	89	1 40	139	1 96	315	3 20	1,583
30.....	2 68	83	.....	.....	1 06	82	1 45	149	2 06	366	3 22	1,615
31.....	2 65	80	.....	.....	1 06	85	.....	.....	2 18	437	.....	.....

NOTE:—Gauge height observations were made at the old gauging station until the end of August. After that they were taken at the cable station. An ice jam a short distance below the station caused backwater on the gauge and made it impossible to compute daily discharges after November 9th.

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE OF BOW RIVER AT LAGGAN, ALTA., for 1911 —Continued.

DAY.	July.		August		September.		October.		November.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	3.19	1567	2.98	1248	6.56	870	4.95	169	4.31	50.2
2.....	3.18	1551	2.93	1178	6.65	919	4.92	162	4.47	71.2
3.....	3.17	1535	2.96	1219	6.67	930	4.90	157	4.53	81.4
4.....	3.09	1410	3.00	1276	6.55	865	4.87	150	4.53	81.4
5.....	3.06	1364	3.01	1291	6.38	773	4.85	145	4.55	85
6.....	3.05	1349	2.99	1262	6.25	703	4.82	138	4.56	86.8
7.....	3.03	1320	2.93	1178	6.08	613	4.79	132	4.53	81.4
8.....	3.00	1276	2.82	1035	5.99	568	4.76	125	4.37	57.4
9.....	2.92	1164	2.75	951	5.90	523	4.76	125	4.30	49
10.....	2.89	1124	2.68	872	5.90	523	4.75	123		
11.....	2.85	1072	2.63	818	5.94	543	4.75	123		
12.....	2.80	1010	2.65	839	6.01	578	4.75	123		
13.....	2.81	1022	2.65	839	6.11	628	4.75	123		
14.....	2.82	1035	2.63	818	6.05	598	4.75	123		
15.....	2.82	1035	2.60	786	5.95	548	4.73	119		
16.....	3.03	1320	2.58	766	5.80	475	4.66	105		
17.....	3.02	1305	2.62	807	5.70	430	4.66	105		
18.....	3.02	1305	2.65	839	5.60	386	4.67	107		
19.....	3.00	1276	2.65	839	5.50	345	4.64	101		
20.....	2.96	1219	2.65	839	5.50	345	4.57	88.6		
21.....	2.98	1248	2.63	818	5.48	337	4.70	113		
22.....	3.02	1305	2.59	776	5.40	307	4.58	99.4		
23.....	3.03	1320	2.57	756	5.32	279	4.54	83.2		
24.....	3.10	1425	2.57	756	5.22	246	4.52	79.6		
25.....	3.20	1583	2.58	766	5.18	234	4.53	81.4		
26.....	3.19	1567	2.57	756	5.14	222	4.35	55		
27.....	3.11	1441	2.47	661	5.08	204	4.33	52.6		
28.....	3.09	1410	2.45	643	5.04	193	4.41	62.4		
29.....	3.08	1395	2.50	688	5.00	182	4.28	46.6		
30.....	3.05	1349	2.55	736	4.97	174	4.40	61		
31.....	3.01	1291	2.55	736			4.42	63.8		

MONTHLY DISCHARGE OF BOW RIVER AT LAGGAN, ALTA., for 1911.

Drainage area, 166 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area	Total in acre-feet.
January.....	216	49	97.1	0.585	0.67	5,970
February.....	90	47	57.8	0.348	0.36	3,210
March.....	89	46	58.3	0.351	0.40	3,585
April.....	149	81.6	99.1	0.597	0.67	5,897
May.....	520	125	317	1.91	2.20	19,492
June.....	2,063	617	1,403	8.45	9.43	83,484
July.....	1,583	1,010	1,309	7.89	9.10	80,488
August.....	1,291	643	897	5.40	6.23	55,154
September.....	930	174	485	2.92	3.26	28,860
October.....	169	46.6	108	0.651	0.75	6,641
November (1-9).....	86.8	49	71.5	0.431	0.14	1,276
The period.....					33.21	294,057

PIPESTONE RIVER NEAR LAGGAN, ALTA.

This station was established August 31, 1911, by H. C. Ritchie. It is located on the S. W. 1/4 Sec. 27, Tp. 28, Rge. 16, W. 5th Mer., about seven eighths of a mile east of Laggan station and about 350 yards below the Canadian Pacific Railway bridge spanning the stream.

The channel is straight for 60 feet above and 100 feet below the station. Both banks are low, but are not liable to overflow. They are covered with low scrub and a sparse growth of spruce. The bed is rocky, but fairly smooth at the cross-section. The fall of the stream is considerable, and the current is swift.

Discharge measurements are made by means of a cable, car, tagged wire and stay wire. The initial point for soundings is a point, suitably marked, on the centre of the left tower, supporting the cable, and distances are marked at every five feet.

The gauge is of the standard chain type, supported over the water by two posts set upright in the left bank of the stream, twelve feet south or downstream from the cable. The zero (elev., 91.54) is referred to a bench mark (assumed elev., 100.00) on an iron spike driven into the side of a spruce tree on the left bank, 22 feet north of the cable.

During 1911, the gauge was read from September 1 to October 14, by F. A. Kerr, and from October 15 to October 31, by E. Braund.

DISCHARGE MEASUREMENTS OF PIPESTONE RIVER, NEAR LAGGAN, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Sept. 5.....	H. Brown	64.5	99.1	2.71	4.95	268.5
Sept. 21.....	do	58.5	74.9	2.13	4.54	159.8
Oct. 17.....	V. A. Newhall.....	52.2	50.2	1.74	4.24	87.2
Nov. 2.....	do	27.5	36.0	0.98	4.19	35.4
Dec. 19.....	do	14.2	31.3	1.38	....	43.3

DAILY GAUGE HEIGHT AND DISCHARGE OF PIPESTONE RIVER, NEAR LAGGAN, ALTA., for 1911.

DAY.	September.		October.	
	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1...	5 12	316	4 40	123
2...	5 15	324	4 40	123
3...	5 17	330	4 40	123
4...	5 08	304	4 39	121
5...	4 95	268	4 38	118
6...	4 90	254	4 37	116
7...	4 80	227	4 36	113
8...	4 75	214	4 35	111
9...	4 70	201	4 35	111
10...	4 70	201	4 34	109
11...	4 72	206	4 33	106
12...	4 80	227	4 33	106
13...	4 90	254	4 33	106
14...	4 76	217	4 33	106
15...	4 75	214	4 33	106
16...	4 68	196	4 30	99
17...	4 65	188	4 33	106
18...	4 60	175	4 33	106
19.....	4 56	165	4 27	92.4
20.....	4 55	162	4 15	69
21.....	4 55	162	4 10	60
22...	4 52	154	4 10	60
23...	4 52	154	4 26	90.2
24...	4 40	123	4 15	60
25.....	4 40	123	4 00	46
26.....	4 45	136	3 98	43.6
27.....	4 47	128	4 05	52
28...	4 42	128	4 00	46
29...	4 42	128	3 98	43.6
30...	4 41	126	4 10	60
31...	....	....	3 98	43.6

NOTE.—An ice jam formed below the station during the cold spell in the early part of November and caused the banks of the stream to overflow. Gauge height observations could not be applied and were therefore discontinued.

SESSIONAL PAPER No. 25d

MONTHLY DISCHARGE OF PIPESTONE RIVER NEAR LAGGAN, ALTA., for 1911.

Drainage area, 122 square miles

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total acre-feet.
September	330	123	200	1.639	1.83	11,901
October	123	43.6	89.8	0.739	0.85	5,522
The period					2.68	17,423

BOW RIVER AT BANFF, ALTA.

This station was established May 25, 1909, by P. M. Sauder. It is located at the highway bridge in the village of Banff, about one mile from the Canadian Pacific Railway station. It is on the quartering line in the S. $\frac{1}{2}$ Sec. 35, Tp. 25, Rge. 12, W. 5th Mer., and is about a mile above the mouth of Spray River, and a short distance below the Vermilion lakes.

The channel is straight for about 300 feet above and 400 feet below the station. Both banks are low and are partly covered with brush and timber, but are not liable to overflow. The bed of the stream is composed of gravel and boulders, the latter making it difficult to obtain accurate soundings at some points. There is a deep hole near the right bank, but the greater part of the cross-section is uniform. The current is sluggish above the station, but the stream becomes swifter as it approaches the bridge, and breaking into rapids a short distance downstream, reaches the Spray Falls about half a mile below. The stream is divided into four channels by the piers supporting the bridge.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is one and a half feet from the north end of the bridge, and distances are marked on the bottom chord of the downstream side of the bridge at every five feet.

The gauge, which is a plain staff, graduated to feet and tenths, is attached to the downstream side of the centre pier. The zero (elev., 92.36) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated on the right bank about forty feet east of the southern extremity of the bridge.

During 1911, the gauge was read by N. B. Sanson, Meteorological Observer at Banff.

DISCHARGE MEASUREMENTS OF BOW RIVER AT BANFF, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft. *
Jan. 23.....	H. R. Carscallen	50	151.6	2.58	0.84	390.6x
Feb. 15.....	do	51	140.6	2.17	0.71	305.5x
Mar. 8.....	do	52	151.4	2.26	0.06	341.4x
Mar. 24.....	do	82.5	172.5	1.97	0.16	340.2†
Apr. 6.....	H. C. Ritchie....	58	148.8	1.89	*0.04	281.3†
Apr. 25.....	do	161.5	586.9	1.01	0.65	592.7
May 10.....	do	240	739.6	1.51	1.24	1,114
May 31.....	B. Russell	284.5	957.5	1.93	1.90	1,852
June 15.....	do	320	1709	4.62	4.35	7,908
June 29.....	do	322	1566	4.03	3.90	6,309
July 13.....	do	320	1305	3.01	2.98	3,928
July 26.....	H. C. Ritchie.	319	1376	3.25	3.30	4,465
Aug. 17.....	H. Brown.....	305	1092	2.25	2.49	2,456
Aug. 31.....	do	297	1042	1.98	2.26	2,066
Sept. 18.....	do	279	872.1	1.56	1.73	1,365
Oct. 18.....	V. A. Newhall	199.5	655.8	1.03	1.09	673.8
Nov. 4.....	do	130.5	556.3	0.99	0.85	553.0
Nov. 24.....	do	114	473.7	1.00	0.76	474.0†
Dec. 21.....	do	54.5	173.0	1.89	0.41	327.4†

*Negative gauge height.

xIce conditions.

†Partly frozen over.

DAILY GAUGE-HEIGHTS AND DISCHARGE OF BOW RIVER, AT BANFF, ALTA., for 1911.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0 25	280	0 76	336	0 40	240	0 06	313	0 76	669	2 35	2,595
2	0 23	260	0 81	367	0 44	270	†*0 01	292	0 90	795	3 10	4,210
3	0 44	345	0 88	416	0 41	285	*0 08	274	0 94	831	3 50	5,200
4	0 47	345	0 92	444	0 20	255	*0 11	268	1 04	921	3 50	5,200
5	0 54	375	1 04	537	†0 16	265	*0 04	283	1 23	1,100	3 15	4,330
6	0 58	375	0 92	444	0 11	280	0 04	307	1 42	1,290	3 00	3,970
7	0 59	375	0 91	437	0 10	300	*0 01	292	1 38	1,250	2 90	3,735
8	0 55	320	0 89	423	0 04	307	*0 02	289	1 31	1,180	2 90	3,735
9	0 29	210	0 91	437	0 04	307	†0 00	295	1 27	1,140	2 90	3,735
10	0 41	240	0 91	437	0 02	301	0 01	298	1 23	1,100	2 95	3,850
11	0 48	235	0 89	423	*0 02	289	*0 01	292	1 22	1,090	3 35	4,815
12	0 60	300	0 87	409	†*0 02	289	*0 05	280	1 21	1,080	3 98	6,572
13	0 59	280	0 73	318	*0 03	286	*0 05	280	1 20	1,070	4 35	7,900
14	0 65	295	0 71	306	0 03	304	*0 04	283	1 20	1,070	4 70	9,310
15	0 70	300	0 67	285	*0 02	289	*0 04	283	1 25	1,120	4 40	8,095
16	0 72	312	0 71	306	*0 01	292	†0 00	295	1 35	1,220	4 35	7,900
17	0 76	336	0 71	306	*0 01	292	0 04	307	1 57	1,452	4 30	7,710
18	0 78	348	0 59	251	*0 01	292	0 03	304	1 70	1,595	4 32	7,786
19	0 82	374	†0 58	247	†0 06	313	0 07	316	1 67	1,562	4 15	7,155
20	0 90	430	0 57	243	0 13	334	0 13	334	1 66	1,551	4 00	6,640
21	0 88	416	0 49	211	0 16	344	0 30	400	1 65	1,540	3 98	6,572
22	0 84	388	0 49	211	0 13	334	0 30	400	1 72	1,619	4 38	8,017
23	0 82	374	0 50	215	0 16	344	0 30	400	1 64	1,529	4 60	8,900
24	0 82	374	0 52	223	0 13	334	0 42	460	1 55	1,430	4 40	8,095
25	0 74	324	0 62	263	0 06	313	0 60	555	1 48	1,353	4 53	8,613
26	0 76	336	†0 55	235	†0 06	313	0 65	590	1 41	1,280	3 98	6,572
27	0 85	395	0 47	203	0 06	313	0 64	583	1 36	1,230	3 98	6,572
28	0 93	451	0 41	210	0 05	310	0 64	583	1 32	1,190	4 00	6,640
29	0 95	465			0 09	322	0 62	569	1 36	1,230	4 00	6,640
30	0 92	444		...	0 12	331	0 64	583	1 44	1,310	3 95	6,470
31	0 88	416		...	0 09	322	...	...	1 73	1,631	....	....

† No observations, gauge height interpolated.
* Negative gauge height.
NOTE.—Very good winter Station

DAILY GAUGE-HEIGHTS AND DISCHARGE OF BOW RIVER, AT BANFF, ALTA., for 1911.—*Con.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3 88	6,252	2 78	3,079	2 30	2,120	1 32	885	0 65	425	0.69	445
2.....	3.88	6,252	2.84	3,225	2 32	2,154	1 32	885	0 67	435	0.72	460
3.....	3.80	6,025	2 86	3,275	2 38	2,259	1 32	885	0 76	480	0.67	435
4.....	3.55	5,330	2 88	3,325	2 38	2,259	1 28	845	0 83	518	0.63	415
5.....	3 27	4,618	2.88	3,325	2 28	2,088	1 27	835	0 80	500	0.58	392
6.....	3.20	4,450	2 88	3,325	2 18	1,930	1 22	788	0 80	500	0.58	392
7.....	3.61	5,493	2 85	3,250	2 07	1,773	1 20	770	†0 71	455	0.60	400
8.....	3.50	5,200	2.86	3,275	2 00	1,675	1 21	779	†0 62	410	0.60	400
9.....	3.25	4,570	2 75	3,010	1 98	1,649	1 19	761	†0 51	364	0.60	400
10.....	3.20	4,450	2.65	2,790	1 92	1,574	1 18	752	†0 38	319	0.59	396
11.....	3.12	4,258	2 58	2,643	1 91	1,562	1 18	752	0 23	276	0.51	364
12.....	3.05	4,090	2 50	2,480	1 91	1,562	1.18	752	0 20	270	0 57	388
13.....	2.98	3,922	2.55	2,580	2 10	1,815	1 17	743	0 21	278	0 55	380
14.....	3 00	3,945	2 48	2,442	1 99	1,662	1.18	752	0 39	322	0.55	380
15.....	3 22	4,545	2 48	2,442	1.93	1,586	1.18	752	0 56	384	0.51	364
16.....	3.28	4,700	2.52	2,520	1 89	1,538	1 13	709	0 66	430	0.51	364
17.....	3.38	4,965	2 45	2,385	1 81	1,442	1 08	671	0 74	470	†0 47	348
18.....	3.38	4,940	2 48	2,442	1 73	1,346	1 08	671	0 81	506	0.44	337
19.....	3.14	4,200	2 48	2,442	1 69	1,298	1 04	641	0 80	500	0 49	356
20.....	3.05	3,915	2.52	2,520	1 62	1,214	1 02	632	0 79	495	0.51	364
21.....	2.97	3,660	2 44	2,367	1 62	1,214	1 00	620	0 79	495	0.41	328
22.....	3.10	3,990	2 39	2,277	1.61	1,202	0 99	614	0 63	415	0.51	364
23.....	3.05	3,840	2 30	2,120	1 59	1,178	0 97	602	0 62	410	0.52	368
24.....	3.00	3,670	2 27	2,072	1 54	1,119	0 98	608	0 60	400	†0 50	360
25.....	3.17	4,095	2.28	2,088	1.48	1,053	0 87	542	0 65	425	0.48	352
26.....	3.29	4,436	2 30	2,120	1 46	1,031	0 75	475	0 62	410	0.41	328
27.....	3 20	4,180	2 21	1,976	1 41	976	0 79	495	0 52	368	0.40	325
28.....	2.94	3,475	2.17	1,915	1 40	965	0 76	480	0 53	372	0 41	328
29.....	2.92	3,425	2.14	1,871	1 38	945	0 72	460	0 55	380	0.61	405
30.....	2.93	3,450	2.18	1,930	1 37	935	0 72	460	0 67	435	0.66	430
31.....	2.85	3,250	2 23	2,008	....	..	0 70	450	....	...	†0.64	420

MONTHLY DISCHARGE OF BOW RIVER AT BANFF, ALTA., for 1911.

(Drainage area, 857 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area	Total in acre-feet.
January	465	210	347	0.405	0.47	21,336
February.....	537	203	327	0.382	0.40	18,161
March.....	344	240	302	0.352	0.41	18,569
April.....	590	268	367	0.428	0.48	21,838
May.....	1,631	669	1,240	1.45	1.67	76,240
June.....	9,310	2,595	6,251	7.30	8.14	371,960
July.....	6,252	3,250	4,438	5.18	5.97	272,878
August.....	3,325	1,871	2,565	2.99	3.45	157,715
September.....	2,259	935	1,504	1.75	1.95	89,494
October.....	885	450	680	0.794	0 92	41,812
November.....	518	270	415	0.484	0.54	24,694
December.....	460	325	380	0.443	0.51	23,365
The year.....					24.91	1,138,062

SPRAY RIVER NEAR BANFF, ALTA.

This station was established July 15, 1910, by J. C. Keith. It is located at a traffic bridge about one mile southeast of the village of Banff, on the N.W. 1⁴ Sec. 25, Tp. 25, Rge. 12, W. 5th Mer., and about 100 yards above the junction with Bow River.

The channel is straight for 75 feet above and 100 feet below the station. The right bank is low, and may overflow at high stages of the stream. The left bank is steep and high. The bed is composed of coarse gravel, and is not liable to shift. The current is swift, but the surface is free from ripples at the station. A quantity of rock has been dumped into the channel at the left abutment of the bridge and affects the accuracy of the results.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the extreme west end of the bottom chord of the bridge.

The gauge, which is a plain staff, graduated to feet and hundredths is nailed to the downstream end of the left abutment. The zero (elev., 93.29) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated on the left bank about fifty feet downstream from the bridge. On Novemebr 3, V. A. Newhall established a chain gauge on the downstream end of the left or west abutment, projecting about five feet over the water. The zero of this gauge (elev., 88.71) is also referred to the above mentioned bench-mark. The length of the chain from the bottom of the weight to the marker is 14.67 feet. Observations were made with the chain gauge after November 11, but for this report have been reduced to the same datum as the staff gauge.

During 1911, the gauge was read by N. B. Sanson, Meteorological Observer, at Banff.

DISCHARGE MEASUREMENTS OF SPRAY RIVER, NEAR BANFF, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
Jan. 25.	H. R. Carscallen.	33.5	104 8	1 62	*3.30	170.3
Feb. 15.	do	22.5	61 2	2 34	*2.05	143.4
Mar. 8.	do	27.5	50 8	2 76	*1.89	140.2
Apr. 8.	do	37.5	59 5	1 99	*0.75	118.6
Apr. 28.....	H. C. Ritchie.	60.5	83 7	2 68	*1.02	224.5
May 12.....	do	74.5	109 8	3 51	*1.35	385.0
June 17.....	B. Russell...	120	356 3	7 05	2.70	2,511
July 3.....	do	119	315 1	6 98	2.22	2,200
July 15.....	do	118.5	255 3	5 85	1.80	1,494
July 28.....	H. C. Ritchie.	117.5	343 6	3 48	1.60	1,958
Aug. 19.....	H. Brown.....	111	168 7	4 42	1.36	745.8
Sept. 2.....	do	92.5	148 7	4 45	1.18	661.3
Sept. 22.....	do	74.5	119 0	3 91	0.89	466.3
Oct. 14.....	V. A. Newhall.	62.5	85 0	3 61	0.70	310.5
Oct. 31	do	40	83 6	3 07	0.36	256.7
Nov. 22.	do	35.5	87 4	2 19	0.58	191.1
Dec. 7.	do	32.5	85 6	2 40	0.75	201.4

*Auxiliary gauge.

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE OF SPRAY RIVER NEAR BANFF, for 1911.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.58	200	2.47	152	1.94	140	0.85	158	1.07	246	1.90	815
2....	1.29	195	2.48	152	1.98	141	†0.80	140	1.10	260	2.20	1,190
3.....	1.76	198	2.50	153	1.72	135	0.75	122	1.14	278	2.56	1,852
4....	2.11	200	2.44	151	1.82	137	0.73	116	1.17	292	2.55	1,830
5....	2.07	195	2.45	152	†1.92	140	0.74	119	1.26	335	2.38	1,484
6.....	2.02	192	2.36	149	2.03	143	0.75	122	1.36	388	2.40	1,520
7.....	1.78	188	2.25	147	1.93	140	0.77	130	†1.35	382	*1.54	1,520
8.....	1.82	186	2.30	148	1.99	142	0.77	130	1.35	382	1.53	1,502
9.....	2.10	188	2.46	152	1.88	139	†0.77	130	1.37	394	1.48	1,112
10.....	3.92	228	2.36	149	1.88	139	0.78	133	1.36	388	1.52	1,454
11.....	5.22	255	2.23	147	1.89	139	0.77	130	1.36	388	1.88	1,476
12.....	4.63	240	2.20	146	†1.94	140	0.77	130	1.35	382	2.26	1,920
13.....	5.10	246	2.14	145	2.00	142	0.77	130	1.35	382	2.65	2,390
14.....	5.12	245	2.16	145	1.77	136	0.78	133	†1.35	382	2.45	1,920
15.....	5.04	240	2.05	143	2.33	149	0.77	130	1.35	382	2.70	2,510
16.....	4.83	232	2.13	145	2.11	144	†0.76	126	1.38	399	2.65	2,390
17.....	4.68	226	2.00	142	2.72	157	0.76	126	1.44	436	2.65	2,390
18.....	4.38	215	1.87	138	2.27	147	0.77	130	1.46	449	2.75	2,640
19.....	4.23	206	2.10	144	†2.02	142	0.79	136	1.48	462	2.68	2,460
20.....	4.08	202	2.03	143	1.782	137	0.81	144	1.46	449	2.58	2,220
21.....	3.99	198	1.99	142	1.49	140	0.87	164	1.45	442	2.52	2,090
22.....	4.12	198	1.98	141	1.33	140	0.89	172	1.46	449	2.62	2,320
23.....	3.68	180	2.10	144	1.36	142	†0.92	183	1.46	449	2.70	2,510
24....	3.49	175	1.97	141	1.25	148	0.96	199	1.44	436	2.55	2,160
25.....	3.27	169	†1.98	141	1.12	150	1.01	220	1.38	399	2.65	2,390
26.....	3.20	168	†1.99	142	†0.98	150	1.02	224	1.37	394	2.35	2,500
27....	3.16	167	2.00	142	0.84	154	1.02	224	1.34	377	2.35	2,500
28.....	3.12	166	1.97	141	0.80	140	1.02	224	1.32	366	2.25	2,260
29.....	3.00	163	..	..	0.82	147	1.01	220	1.33	372	2.25	2,260
30.....	2.92	161	..	..	0.81	144	†1.04	233	1.37	394	2.32	2,428
31.....	2.64	156	....	..	0.79	136	..	..	1.55	512	..	..

* Readings made at regular gauge after June 7th.
† No observations, gauge height interpolated.

DAILY GAUGE HEIGHT AND DISCHARGE OF SPRAY RIVER NEAR BANFF, for 1911.—Continued.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2 28	2,332	1 55	995	1 22	690	0 79	395	0 24	225	0 67	198
2.....	2 25	2,260	1 56	1,000	1 18	664	0 79	390	0 20	215	0 60	191
3.....	2 25	2,260	1 58	1,020	1 22	696	0 77	380	0 50	300	0 63	194
4.....	2 15	2,050	1 58	1,020	1 29	752	0 76	370	0 35	255	0 65	196
5.....	2 02	1,780	1 56	995	1 22	696	0 76	370	0 36	258	0 69	199
6.....	1 95	1,660	1 55	980	1 19	672	0 73	355	0 34	252	0 78	201
7.....	2 20	2,240	1 55	980	1 17	656	0 70	340	†0 36	250	0 72	200
8.....	1 95	1,690	1 56	985	1 13	624	0 70	335	†0 38	235	0 72	200
9.....	†1 88	1,580	1 56	985	1 09	593	0 69	330	†0 40	235	0 63	194
10.....	1 82	1,480	1 54	955	1 07	579	0 69	325	†0 42	230	0 52	188
11.....	1 82	1,490	1 53	945	1 06	572	0 69	320	†1 45	225	0 53	189
12.....	1 75	1,390	1 50	910	1 06	572	0 70	320	0 54	235	0 68	198
13.....	1 75	1,400	1 48	880	†1 05	565	0 69	315	0 68	238	0 74	200
14.....	1 75	1,410	1 47	870	1 05	565	0 69	305	0 62	230	0 75	201
15.....	1 85	1,590	1 46	850	1 02	544	0 69	310	1 11	258	0 72	200
16.....	1 85	1,580	1 45	830	0 99	524	0 67	305	1 13	255	0 62	192
17.....	1 90	1,670	†1 41	795	0 98	518	0 65	305	1 14	250	†0 68	198
18.....	1 85	1,560	1 37	755	0 96	506	0 64	305	0 95	232	0 74	200
19.....	1 78	1,430	1 36	745	0 92	482	0 62	300	0 89	225	0 98	218
20.....	1 70	1,300	1 38	770	0 92	482	0 64	310	0 86	215	0 99	218
21.....	1 72	1,310	1 36	755	0 91	476	0 61	305	0 72	200	1 02	220
22.....	1 75	1,350	1 32	725	0 89	465	0 61	310	0 79	202	1 07	222
23.....	1 72	1,300	1 27	690	0 88	455	0 59	305	0 84	207	0 92	211
24.....	1 68	1,220	1 24	670	0 88	455	0 59	310	0 78	202	†0 95	213
25.....	1 72	1,270	1 22	660	0 84	430	0 55	300	0 59	190	0 99	218
26.....	1 76	1,310	1 27	705	0 84	430	0 54	300	0 52	188	1 45	245
27.....	1 68	1,180	1 22	670	0 83	425	0 44	270	0 42	180	1 78	260
28.....	1 62	1,085	1 18	640	0 83	420	0 39	260	0 57	190	1 68	250
29.....	1 60	1,050	1 17	635	0 82	410	0 37	260	0 68	198	1 10	200
30.....	1 55	1,000	1 17	640	0 80	400	0 32	240	0 75	201	1 42	220
31.....	1 54	990	1 18	650	.....	.....	0 07	232	2 35	.....	†1 68	235

MONTHLY DISCHARGE OF SPRAY RIVER, NEAR BANFF, ALTA, for 1911.

(Drainage area, 310 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January.....	255	156	199	0.642	0.74	12,236
February.....	153	138	146	0.471	0.49	8,108
March.....	157	135	143	0.461	0.53	8,793
April.....	233	116	156	0.503	0.56	9,283
May.....	512	246	389	1.255	1.45	23,919
June.....	2,640	815	2,011	6.49	7.24	119,660
July.....	2,332	990	1,523	4.91	5.66	93,646
August.....	1,020	635	829	2.67	3.08	50,973
September.....	752	400	544	1.755	1.96	32,370
October.....	395	232	315	1.016	1.17	19,369
November.....	300	180	226	0.729	0.81	13,448
December.....	260	188	209	0.674	0.78	12,851
The year.....					24.47	404,656



Canyon on Cascade River near Bankhead, Alta. Taken by P. M. Sauder.



Gauging Station on Cascade River near Bankhead, Alta. Taken by P. M. Sauder.

CASCADE RIVER AT BANKHEAD, ALTA.

This station was established August 16, 1911, by P. M. Sauder. It is located at a small log footbridge on the S. E. ¼ Sec. 19, Tp. 26, Rge. 11, W. 5th Mer., in the town of Bankhead, on the property of the Bankead Mines and about 100 feet below their dam.

The channel is straight for 100 feet above and below the station. Both banks are low, but are not liable to overflow. The bed is composed of coarse gravel, which is not liable to shift. The current is swift.

Discharge measurements are made from the downstream side of the footbridge. The initial point for soundings is the left end of the bridge and is suitably marked.

The gauge which is a plain staff, graduated to feet and hundredths, is spiked to the cribbing which supports the north end of the bridge. It is referred to a bench-mark on a tree stump on the left bank a few feet downstream from the bridge (elevation above gauge datum, 5.51 feet.)

The gauge was read once each day by R. Lewin, a clerk at the Bankhead Mines.

DISCHARGE MEASUREMENTS OF CASCADE RIVER AT BANKHEAD, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 27	H. R. Carscallen	27	45.0	2.72	....	122.0
Feb. 14	do	27	35.8	2.82	....	101.0
Mar. 7	do	27	34.1	2.84	....	97.1
Mar. 24	do	42	53.2	2.10	....	111.8
Apr. 26	H. C. Ritchie	49	55.5	2.09	....	116.2
Aug. 16	H. Brown	45.1	144.3	4.95	1.58	714.2
Aug. 21	do	45.1	141.3	4.38	1.46	618.7
Sept. 1	do	44.6	127.8	3.89	1.36	496.4
Sept. 19	do	44.8	123.7	3.84	1.19	381.5
Oct. 16	V. A. Newhall	44.8	126.0	1.97	1.04	248.6
Nov. 6	do	45	100.1	1.79	0.89	178.8
Nov. 23	do	43.5	99.4	1.55	..	154.1*
Dec. 8	do	38	89.0	1.56	0.73	139.3
Dec. 22	do	43.3	114.1	0.90	1.73	103.0

*No gauge.

DAILY GAUGE-HEIGHT AND DISCHARGE OF CASCADE RIVER AT BANKHEAD, ALTA., for 1911

DAY.	August.		September.		October.		November.		December.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge	Height	charge	Height	charge	Height	charge.	Height.	charge.
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.			1 35	486	1 08	296	0.84	160		
2.			1 34	480	1 07	287	0.85	163		
3.			1 36	500	1 06	280	0.85	163		
4.			1 35	493	1 05	274	0.86	167		
5.			1 35	496	1 04	267	0.87	171		
6.			1 35	499	1 04	264	0.88	175		
7.			1 35	501	1 03	258	0.90		†	
8.			1 33	484	1 03	257	0.93		0.73	
9.			1 32	478	1 03	256	0.98		0.75	
10.			1 30	461	1 02	247	1.08		0.92	
11.			1 30	464	1 02	246	1.26		1.22	
12.			1 28	447	1 02	244	1.50		1.42	
13.			1 27	440	1 03	250	1.68		1.62	
14.			1 26	434	1 01	238	1.75		1.97	
15.			1 26	436	1 01	236	1.75		2.27	
16.	1 58	714	1 25	428	1 00	228	1.73		2.52	
17.	† 1 56	701	1 24	420	0 99	223	1.45		2.72	
18.	† 1 53	675	1 22	405	0 98	218	†		3.02	
19.	1 50	649	1 20	390	0 97	214			2.97	
20.	1 48	634	1 18	374	0 96	209			2.57	
21.	1 46	619	1 16	360	0 96	209			2.27	
22.	1 50	659	1 14	343	0 94	200			1.87	
23.	1 50	656	1 12	328	0 93	196			1.52	
24.	1 48	633	1 12	328	0 92	191			1.52	
25.	1 50	651	1 11	320	0 91	187			1.77	
26.	1 50	648	1 10	313	0 90	183			1.77	
27.	1 46	606	1 10	313	0 89	179			1.77	
28.	1 44	583	1 09	304	0 87	171			1.82	
29.	1 40	541	1 09	304	0 86	167			1.82	
30.	1 38	520	1 08	298	0 85	163			1.67	
31.	1 36	499			0 83	156			1.57	

† No observation, gauge height interpolated.
‡ Gauge carried away by ice on Nov. 18. Replaced Dec. 9.
NOTE.—Not sufficient data to compute daily discharges after Nov. 6.

MONTHLY DISCHARGE OF CASCADE RIVER AT BANKHEAD, ALTA., for 1911.

Drainage area, 248 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
August (16-31).....	714	499	624	2.516	1.50	19,803
September.....	501	298	411	1.657	1.85	24,456
October.....	296	156	226	0.911	1.05	13,896
November (1-6).....	175	160	166	0.669	0.15	1,976
The period.....					4.55	60,131

DEVIL'S CREEK NEAR BANKHEAD, ALTA.

This gauging station, located on the S.E. 1⁴ Sec. 28, Tp. 26, Rge. 11, W. 5th Mer., and within 300 yards of Lake Minnewanka Chalet, was established June 18, 1910, by J. C. Keith. It is about eight miles north and east of Banff.
The gauge is a plain staff, graduated to feet and hundredths, placed at the right bank. The zero (elev., 95.82) is referred to a permanent iron bench-mark (assumed elev., 100.00), situated forty feet east of the gauge.

The channel is straight for about 100 feet above and 300 feet below the station. Both banks are low, swampy and covered with timber and brush. The stream-bed is of soft mud and very uneven, Several hundred yards downstream is an old dam which raises the water-

SESSIONAL PAPER No. 25d

level about three feet above normal. Consequently the water at the station is deep and sluggish, being apparently dead at ordinary stages of the creek. On this account all discharge measurements are made at the traffic bridge, close to the mouth of the creek on the trail from Banff. The creek here flows in a narrow channel over a rough rocky bed and between high rocky banks. The initial point for soundings is painted on the downstream guard-rail on a line with the inner face of the left abutment.

During 1911, the gauge was read daily by Commander Way, R.N., proprietor of the Lake Minnewanks Chalet, until October 31, and after that by Andrew Roper.

DISCHARGE MEASUREMENTS OF DEVILS CREEK, NEAR BANKHEAD, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 27.....	H. R. Carscallen	24	26 9	2 41	1 11	64.9
Feb. 14.....	do	24	24 4	1 59	1 07	38.8
Mar. 7.....	do	24	22 2	1 85	1 01	41.0
Mar. 24.....	do	24	19 4	1 76	0 94	34.2
Apr. 26.....	H. C. Ritchie....	24	20 1	1 93	1 03	38.9
May 10.....	do	24	22 2	2 10	1 15	46.5
June 2.....	B. Russell.....	24	35 8	3 15	1 53	112.9
June 17.....	do	24	55 0	4 33	1 96	238.4
July 15.....	do	25	19 4	4 13	1 87	204.0
Aug. 16.....	H. Brown	25	50 4	4 20	1 88	211.8
Sept. 1.....	do	25	46 6	3 84	1 79	179.0
Sept. 19.....	do	25	46 5	3 64	1 78	171.1
Oct. 16.....	V. A. Newhall.	25	40 1	3 05	1 56	122.1
Nov. 6.....	do	24	33 4	2 78	1 42	92.9
Nov. 23.....	do	24	50 8	2 38	1 26	73.3
Dec. 8.....	do	24	28 6	2 37	1 26	67.7
Dec. 22.....	do	22	20 4	1 76	1 22	36.0
Dec. 27.....	do	20.5	21 9	1 77	1 27	38.8

DAILY GAUGE-HEIGHT AND DISCHARGE OF DEVIL'S CREEK, NEAR BANKHEAD, for 1911

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1 02	49	1 13	60	1 09	44	1 02	38	1 06	41	1 45	98
2.....	0 96	45	1 13	56	1 06	43	1 02	38	1 06	41	1 54	116
3.....	0 91	42	1 12	56	1 07	43	1 01	38	1 07	41	1 66	144
4.....	0 88	40	1 10	53	1 05	43	1 02	38	1 07	41	1 66	144
5.....	0 88	40	1 11	53	1 16	44	1 03	39	1 07	41	1 67	146
6.....	0 91	42	1 12	53	1 02	41	1 02	38	1 10	43	1 68	149
7.....	0 93	44	1 10	50	1 03	42	1 01	38	1 10	43	1 70	154
8.....	0 92	44	1 11	49	1 05	43	1 00	37	1 11	44	1 68	149
9.....	0 91	43	1 12	49	1 05	43	1 01	38	1 09	42	1 66	144
10.....	0 97	47	1 08	44	1 00	39	1 01	38	1 10	43	1 68	149
11.....	1 01	50	1 08	43	1 00	39	1 01	38	1 12	47	1 71	157
12.....	1 06	55	1 06	41	1 00	39	1 01	38	1 14	49	1 77	174
13.....	1 09	58	1 08	40	1 00	39	1 01	38	1 18	52	1 86	201
14.....	1 08	57	1 07	39	1 02	40	1 01	38	1 20	55	1 92	223
15.....	1 10	59	1 08	40	1 00	39	1 00	37	1 20	56	1 96	235
16.....	1 11	61	1 07	39	1 00	39	0 80	28	1 23	59	1 99	251
17.....	1 11	61	1 07	40	0 96	37	0 90	32	1 24	61	1 99	251
18.....	1 10	60	1 08	40	0 95	36	1 00	37	1 23	61	1 99	251
19.....	1 10	60	1 08	41	1 00	38	1 00	37	1 25	65	2 01	259
20.....	1 12	62	1 08	41	0 96	36	1 00	37	1 24	65	1 99	251
21.....	1 16	67	1 06	40	0 96	36	1 00	37	1 24	66	1 98	247
22.....	1 18	69	1 09	42	0 95	35	1 00	37	1 25	67	1 97	247
23.....	1 17	68	1 08	41	0 97	36	1 01	38	1 33	76	1 97	242
24.....	1 17	68	1 07	42	1 00	37	1 00	37	1 32	76	2 06	281
25.....	1 10	62	1 09	43	1 00	37	1 00	37	1 33	78	2 07	286
26.....	1 10	63	1 07	42	0 90	32	1 02	38	1 34	80	2 06	281
27.....	1 12	65	1 10	44	0 60	21	1 05	40	1 33	80	2 06	281
28.....	1 20	72	1 07	43	0 50	19	1 04	39	1 34	81	2 08	290
29.....	1 15	65	.....	.....	0 80	28	1 05	40	1 30	77	2 08	290
30.....	1 15	64	.....	.....	1 00	37	1 05	40	1 33	81	2 09	295
31.....	1 13	61	.....	.....	1 02	38	...	...	1.39	89	...	....

DAILY GAUGE-HEIGHT AND DISCHARGE OF DEVILS CREEK, NEAR BANKHEAD, for 1911.—*Con.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.02	264	1.70	154	1.79	179	1.68	149	1.47	102	1.31	76
2.....	2.00	255	1.72	160	1.77	174	1.68	149	1.46	100	1.33	78
3.....	2.01	259	1.75	168	1.80	182	1.66	144	1.45	98	1.33	78
4.....	1.99	251	1.78	176	1.88	208	1.65	141	1.46	100	1.29	73
5.....	1.99	251	1.79	179	1.90	215	1.61	131	1.46	100	1.31	74
6.....	1.98	247	1.83	191	1.89	211	1.61	131	1.45	98	1.21	64
7.....	1.98	247	1.88	208	1.88	208	1.61	131	1.45	98	1.34	76
8.....	1.97	242	1.90	215	1.88	208	1.60	129	1.47	102	1.28	69
9.....	1.93	226	1.92	223	1.88	208	1.60	129	1.47	102	1.29	69
10.....	1.91	219	1.93	226	1.86	201	1.61	131	1.45	98	1.26	64
11.....	1.89	211	1.90	215	1.86	201	1.59	127	1.42	93	1.25	61
12.....	1.88	208	1.88	208	1.85	197	1.59	127	1.40	90	1.29	63
13.....	1.88	208	1.90	215	1.81	185	1.59	127	1.39	89	1.22	54
14.....	1.87	204	1.89	211	1.80	182	1.57	122	1.40	90	1.25	54
15.....	1.85	197	1.91	219	1.80	182	1.55	118	1.35	83	1.11	42
16.....	1.83	191	1.89	211	1.78	176	1.56	120	1.37	86	1.25	50
17.....	1.83	191	1.87	204	1.78	176	1.54	116	1.36	84	1.22	46
18.....	1.83	191	1.88	208	1.78	176	1.55	118	1.39	89	1.21	43
19.....	1.82	188	1.89	211	1.78	176	1.55	118	1.39	89	1.22	42
20.....	1.79	179	1.88	208	1.78	176	1.54	116	†1.39	89	1.10	34
21.....	1.79	179	1.87	204	1.78	176	1.53	114	1.36	84	1.08	31
22.....	1.79	179	1.89	211	1.77	174	1.54	116	1.35	83	1.22	36
23.....	1.78	176	1.86	201	1.77	174	1.54	116	1.30	77	1.22	36
24.....	1.78	176	1.84	194	1.73	162	1.52	112	1.33	81	1.28	40
25.....	1.77	174	1.88	208	1.70	154	1.52	112	1.33	81	1.28	40
26.....	1.73	162	1.89	211	1.69	151	1.50	108	1.36	84	1.28	40
27.....	1.71	157	1.87	204	1.69	151	1.50	108	1.38	86	1.27	39
28.....	1.71	157	1.85	197	1.68	149	1.47	102	1.37	84	1.22	36
29.....	1.69	151	1.80	182	1.66	144	1.47	102	1.38	85	1.21	36
30.....	1.69	151	1.79	179	1.67	146	1.47	102	1.29	74	1.21	36
31.....	1.68	149	1.78	176	.....	.....	1.47	102	.....	.....	†1.21	36

† No observation, gauge height interpolated.

MONTHLY DISCHARGE OF DEVIL'S CREEK NEAR BANKHEAD, ALTA., for 1911.

(Drainage area, 58 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January.....	72	40	56.2	0.969	1.12	3,456
February.....	60	39	45.2	0.779	0.81	2,510
March.....	44	19	37.5	0.647	0.75	2,306
April.....	40	28	37.4	0.645	0.72	2,226
May.....	89	41	59.4	1.024	1.18	3,652
June.....	205	98	213	3.672	4.10	12,674
July.....	264	149	201	3.466	4.00	12,359
August.....	226	154	199	3.431	3.96	12,236
September.....	215	144	180	3.103	3.46	10,711
October.....	149	102	122	2.103	2.42	7,501
November.....	102	74	90.0	1.551	1.73	5,355
December.....	78	31	52.1	0.898	1.04	3,204
The year.....					25.29	78,190

SESSIONAL PAPER No. 25d

KANANASKIS RIVER NEAR KANANASKIS, ALTA.

This station was established August 31, 1911, by P. M. Sauder. It is located on the N.W. $\frac{1}{4}$ Sec. 33, Tp. 24, Rge. 8, W. 5th Mer. The station is about three miles east of Kananaskis station and about one and a half miles west of Horseshoe Falls siding, about 350 yards north and east of the C. P. R. bridge spanning the river and about 200 feet above the mouth of the stream.

The channel is straight for 400 feet above and 50 feet below the station. Both banks are high; the right bank is composed of rock and the left of coarse gravel. The bed of the stream is solid rock near the right bank and coarse gravel throughout the remainder of the cross-section. The current is very swift.

Discharge measurements are made from a car suspended from a cable, a current meter being used for velocity observations. The initial point for soundings is a spike driven in the upstream side of the cable support on the left bank and distances are marked at every five feet by a tagged wire.

The gauge, which is of the standard chain type, is supported by two posts in the right bank, about eight feet upstream from the cable. It is referred to a bench-mark on a stump six feet upstream, elevation 15.09.

The gauge was read once each day by the Calgary Power Co., the observations being taken by J. Gipson for the company.

DISCHARGE MEASUREMENTS OF KANANASKIS RIVER NEAR KANANASKIS, ALTA., for 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Feb. 11.....	H. R. Carscallen.....	35	66.8	1.97	.....	131.7
Mar. 4.....	do.....	32	58.4	1.87	.....	109.4
Mar. 22.....	do.....	32	56.1	2.19	.....	122.8
Sept. 6.....	H. Brown.....	63.5	178.6	5.68	7.03	1,014.7
Sept. 16.....	do.....	62.1	143.5	5.04	6.46	724.0
Oct. 13.....	V. A. Newhall.....	60.5	101.3	3.77	5.76	371.9
Nov. 29.....	do.....	55	74.0	2.88	5.62	212.1
Dec. 11.....	do.....	59	90.7	2.38	5.62	215.9

DAILY GAUGE-HEIGHT AND DISCHARGE OF KANANASKIS RIVER, NEAR KANANASKIS, ALTA.,
for 1911.

DAY.	September.		October.		November.		December.	
	Gauge Height	Dis-charge.	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft
1.	6.73	860	5.83	404	5.37	172		
2.	6.72	855	5.85	415	5.40	187	5.16	
3.	6.74	865	5.81	394	5.38	177	5.15	
4.	7.34	1168	5.80	389	5.35	162	5.14	
5.	7.10	1047	5.76	369	5.34	157	5.15	
6.	7.00	996	5.75	364	5.36	167	5.16	
7.	6.88	936	5.71	344	5.38	177	5.13	
8.	6.76	875	5.69	334	5.30	136	5.12	
9.	6.71	850	5.70	339	5.25	111	5.10	
10.	6.63	809	5.68	329	5.25	111	5.11	
11.	6.61	799	5.67	324	5.25	111		
12.	6.58	784	5.66	318				
13.	6.54	764	5.65	313				
14.	6.53	759	5.66	318				
15.	6.48	733	5.64	308				
16.	6.43	708	5.63	203				
17.	6.36	673	5.64	308			5.25	
18.	6.30	642	5.62	298			5.35	
19.	6.30	642	5.61	293			5.35	
20.	6.23	607	5.59	283			5.33	
21.	6.15	566	5.58	278			5.31	
22.	6.17	577	5.57	273			5.30	
23.	6.12	551	5.56	268			5.29	
24.	6.08	531	5.55	263			5.28	
25.	6.05	516	5.54	258	5.24		5.26	
26.	6.01	496	5.52	248	5.27		5.26	
27.	5.99	485	5.51	243	5.28		5.20	
28.	5.98	480	5.45	212			5.18	
29.	5.90	440	5.44	207			5.17	
30.	5.88	430	5.43	202			5.15	
31.			5.40	187			5.14	

NOTE.—Stream frozen over on Nov. 12, observer did not read the gauge from Nov. 12 to 24, Nov. 29 to Dec. 1, and Dec. 11 to 15. The gauge height readings from Nov. 25 to end of year are of little value. It was difficult to read the gauge and the observer did not cut a large enough hole. His readings do not agree with those of the hydrographer. As the observer was away from home at the time of the visit of the hydrographer it was not until after the end of the year that he was shown the correct method of making observations.

MONTHLY DISCHARGE OF KANANASKIS RIVER NEAR KANANASKIS, ALTA., for 1911.

(Drainage area, 406 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.		
	Maximum	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
September	1,168	430	715	1.761	1.96	42,545
October	415	187	300	0.739	0.85	18,446
November (1-11)	187	111	152	0.374	0.15	3,316
The period					2.96	64,307

BOW RIVER NEAR MORLEY, ALTA.

This station was established May 25, 1910, by J. C. Keith. It is located at the traffic bridge in Sec. 22, Tp. 25, Rge. 7, W. 5th Mer.; in the Stony Indian reserve, a short distance from the Indian agency and about three quarters of a mile from the village of Morley. The channel is straight for about 600 feet above the station, then curves slightly to the right, but is almost straight for more than half a mile. It is straight for about 500 feet below the station, then curves sharply to the left. The right bank is low and partly covered with brush, but is not liable to overflow. The left bank is high, steep, gravelly and free from brush. The bed of the stream is composed of sand and gravel. The current is swift but smooth.

Discharge measurements are made from the downstream side of the bridge, which is a two-span steel structure supported by concrete abutments and pier, with a short wooden approach on the south and supported by piles. The initial point for soundings is the anchor-bolt in the bed-plate on the north pier, and distances are marked at every five feet on the bottom chord of the bridge.

The gauge, which is of the standard type, is fixed to the floor of the bridge near the centre pier. The length of chain from the bottom of the weight to the marker is 19.17 feet. The zero is referred to bench-marks as follows:— (1) wooden block nailed to the downstream pile in the first row supporting the approach on the left bank (elevation, 12.09); (2) the top of a nut on a bolt in the pile nearest to the south abutment (elevation, 8.58).

During 1911 the gauge was read from January 1 to October 14 by S. Christianson, and from October 15 to the end of the year by W. B. Steinhauer.

Since the Calgary Power and Transmission Company have been operating their plant at the Horseshoe Falls which is only about eight miles upstream, the water surface has fluctuated a great deal and the records have not been satisfactory. This station, was, therefore, abandoned at the end of 1911, and since then observations have been made at the C. P. R. bridge near Kananaskis, which is above the falls and the power plant.

DISCHARGE MEASUREMENTS OF BOW RIVER NEAR MORLEY, ALTA., in 1911.

Date.	Hydrographer.	Width	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 21	H. R. Carscallen	143	328.1	2 06	2 83	675.0†
Feb. 10	do	89	302.5	2 22	2 95	671.3†
Mar. 3	do	114	369.5	1 66	2 85	613.5x
Mar. 21	do	114	412.0	1 77	2 53	730.6x
Apr. 5	H. C. Ritchie	107	406.6	1 80	0 80	733.2‡
Apr. 25	do	162.5	668.1	1 41	0 89	941 6
May 9	do	179	866.3	2 53	1 85	2,190
May 30	B. Russell	196.5	865.9	2 74	2 04	2,377
June 14	do	241.2	1,748	7 07	6 08	12,375 [▲]
July 12	do	217.5	1,350	5 71	4 42	7,702
Aug. 14	H. Brown	198.4	1,200	4 94	3 69	5,930
Sept. 23	do	198	932.1	2 95	2 26	2,746
Oct. 12	V. A. Newhall	174.4	804.3	2 26	1 73	1,821
Nov. 17	do	174.6	915.5	1 50	3 50	1,374*
Nov. 27	do	177.6	952.8	0 85	3 24	807.2*
Dec. 14	do	187.6	841.8	1 30	2 74	1,091**

† Stream frozen over, conditions bad, results approximate.
x Stream frozen over.
‡ Stream partly frozen over, results may be slightly inaccurate.
▲ May be slight error due to inaccuracy of soundings.
* Large amount of slush ice, results only approximate.
** Large amount of slush ice. Compared with the records at Banff and Calgary the discharge appears to be too high.

DAILY GAUGE-HEIGHT AND DISCHARGE OF BOW RIVER NEAR MORLEY, ALTA., for 1911.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.85	.....	2.75	590	2.85	614	0.74	694	1.20	1,240	3.35	5,040
2.....	2.30	.....	2.75	586	2.85	614	0.70	670	1.27	1,317	4.40	7,700
3.....	†2.40	.....	2.80	610	2.83	604	0.70	670	1.36	1,422	4.80	8,740
4.....	†2.45	.....	2.75	582	2.75	564	0.70	670	1.40	1,470	4.90	9,000
5.....	†2.50	.....	2.85	630	2.80	588	0.76	708	1.60	1,720	†4.62	8,272
6.....	2.60	.....	2.85	626	2.75	564	0.88	808	1.90	2,160	4.35	7,570
7.....	†2.60	.....	2.90	652	2.85	614	0.65	674	1.80	2,010	4.05	6,790
8.....	2.60	.....	2.85	620	2.80	588	0.68	708	1.80	2,010	3.95	6,530
9.....	2.15	.....	2.90	646	2.80	588	0.75	768	1.82	2,040	3.85	6,275
10.....	1.95	.....	2.90	642	2.70	564	0.72	768	1.80	2,010	3.90	6,400
11.....	2.15	.....	2.95	672	2.65	562	0.70	774	1.75	1,935	4.40	7,700
12.....	2.25	.....	3.00	704	2.60	560	0.65	755	1.80	2,010	5.15	9,690
13.....	2.45	.....	2.95	672	2.60	580	*0.35	340	1.85	2,085	5.80	11,550
14.....	2.50	.....	2.90	642	2.55	576	0.65	755	1.80	2,010	6.10	12,460
15.....	2.70	.....	2.85	614	2.65	652	0.70	790	1.75	1,935	6.20	12,770
16.....	2.75	.....	2.75	564	2.60	648	0.68	776	1.95	2,240	6.15	12,615
17.....	2.95	.....	2.80	588	2.60	672	0.70	790	2.10	2,480	6.10	12,460
18.....	2.95	.....	2.85	614	2.63	720	0.74	822	2.20	2,640	6.05	12,305
19.....	2.80	.....	2.80	588	2.60	724	0.70	790	2.18	2,608	6.00	12,150
20.....	2.85	.....	2.80	588	2.56	726	0.75	830	2.25	2,725	5.75	11,405
21.....	2.80	654	2.75	564	2.55	746	0.80	870	2.27	2,759	5.65	11,115
22.....	2.85	680	2.85	614	2.50	790	*0.35	340	2.26	2,742	5.75	11,405
23.....	2.80	646	2.85	614	2.47	856	0.90	950	2.37	2,943	6.20	12,770
24.....	2.70	590	2.83	604	2.30	814	1.22	1,262	2.27	2,759	6.35	13,235
25.....	2.70	586	2.85	614	2.25	862	0.98	1,022	2.17	2,592	6.45	13,545
26.....	2.60	536	2.80	588	2.15	878	†1.06	1,100	2.10	2,480	6.05	12,305
27.....	2.55	512	2.85	614	2.07	904	1.15	1,190	2.05	2,400	5.65	11,115
28.....	2.65	554	2.80	588	1.05	920	1.10	1,140	1.95	2,240	5.60	10,970
29.....	2.75	598	.....	.....	0.85	766	1.17	1,210	1.98	2,288	5.55	10,825
30.....	2.70	570	.....	.....	0.80	732	1.12	1,160	2.06	2,416	5.55	10,825
31.....	2.75	592	.....	.....	0.76	708	.....	.....	2.60	3,400	.....	.....

PLATE NO. 14.



Gauging Station on Ghost River at Gillie's Rancho in Winter.
Taken by V. A. Newhall.



Winter Gauging of Southfork River near Cowley, Alta. Taken by P. M. Sauder.

DAILY GAUGE-HEIGHT AND DISCHARGE OF BOW RIVER NEAR MORLEY, ALTA., for 1911.—Con.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5 50	10,680	3 86	6,300	†3 05	4,345	1 95	2,240	1.48	1,566	3 30	....
2.....	5 55	10,825	†3 90	6,400	3 10	4,460	1 97	2,272	†1.48	1,566	3 26	....
3.....	5 40	10,390	3 95	6,530	3 15	4,575	1 95	2,240	†1.48	1,566	3 31	....
4.....	5 20	9,830	4 00	6,660	3 40	5,160	1 90	2,160	1.48	1,566	3 19	....
5.....	†4 95	9,135	4 05	6,790	3 30	4,920	1 85	2,085	1.35	1,410	3 26	....
6.....	4 70	8,480	4 15	7,050	†3 21	4,713	1 80	2,010	1.61	1,734	3 14	....
7.....	4 90	9,000	4 25	7,310	3 12	4,506	1 70	1,860	1.45	1,530	3 03	....
8.....	5 00	9,270	4 30	7,440	3 00	4,230	1 78	1,980	1.53	1,629	3 10	....
9.....	4 75	8,610	4 15	7,050	2 95	4,120	1 70	1,860	....	....	3 31	....
10.....	4 55	8,090	4 03	6,738	3 20	4,690	1 56	1,668	....	....	3 03	....
11.....	4 40	7,700	†3 91	6,426	2 75	3,700	1 65	1,790	....	....	2 82	....
12.....	4 40	7,700	3 80	6,150	2 75	3,700	1 70	1,860	1.73	....	2 85	....
13.....	4 25	7,310	3 70	5,900	2 70	3,600	†1 70	1,860	3.05	....	2 75	....
14.....	4 30	7,440	3 65	5,775	2 70	3,600	1 70	1,860	3.03	....	2 74	....
15.....	4 35	7,570	3 60	5,650	2 65	3,500	1 69	1,846	3.24	....	2 73	....
16.....	4 55	8,090	3 60	5,650	2 60	3,400	1 77	1,965	3.28	....	2 74	....
17.....	4 80	8,740	†3 54	5,500	2 55	3,300	1 69	1,846	3.25	....	2 68	....
18.....	4 70	8,480	†3 47	5,328	2 50	3,200	1 68	1,832	†3.56	....	2 27	....
19.....	†4 47	7,882	3 40	5,160	2 45	3,100	1 66	1,804	3.88	....	2 32	....
20.....	4 25	7,310	3 43	5,232	2 35	2,905	1 59	1,707	3.98	....	2 74	....
21.....	4 18	7,128	3 45	5,280	2 30	2,810	1 69	1,846	3.99	....	2 69	....
22.....	4 22	7,232	3 40	5,160	2 30	2,810	1 68	1,832	3.96	....	2 63	....
23.....	4 25	7,310	3 35	5,040	2 27	2,759	1 71	1,875	4.02	....	2 73	....
24.....	4 15	7,050	†3 27	4,851	2 18	2,608	†1 70	1,860	†3.83	....	2 76	....
25.....	4 15	7,050	3 20	4,690	2 15	2,560	1 69	1,846	†3.63	....	2 62	....
26.....	4 35	7,570	†3 50	5,400	2 10	2,480	1 59	1,707	†3.44	....	2 69	....
27.....	4 30	7,440	3 80	6,150	2 05	2,400	1 48	1,566	3.24	807	2 74	....
28.....	4 15	7,050	3 05	4,345	2 00	2,320	†1 42	1,494	3.07	724	2 72	....
29.....	4 05	6,790	3 03	4,209	2 00	2,320	†1 36	1,422	3.13	800	2 69	....
30.....	3 95	6,530	2 93	4,076	1 95	2,240	1 30	1,350	3.07	798	2 68	....
31.....	3 80	6,150	†2 99	4,208	....	....	1 39	1,458	....	....	2 74	....

During January, February, March and November. Daily discharges for these months are only approximate.
† No observation, gauge height interpolated.
* Negative gauge height. Low water caused by Calgary Power and Transmission Co. holding back the water.
NOTE—Data insufficient to compute the daily discharge from Jan. 1 to 20, Nov. 9 to 26 and Dec. 1 to 31.
Ice conditions.

MONTHLY DISCHARGE OF BOW RIVER NEAR MORLEY, ALTA., for 1911.
(Drainage area, 2111 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January (21-31).....	680	512	593	0.281	0.11	12,938
February.....	704	564	615	0.291	0.30	34,155
March.....	920	560	687	0.325	0.37	42,242
April.....	1,262	340	827	0.392	0.44	49,210
May.....	3,400	1,240	2,229	1.06	1.22	137,058
June.....	13,545	5,040	10,184	4.82	5.38	605,990
July.....	10,825	6,150	8,059	3.82	4.40	495,529
August.....	7,440	4,076	5,759	2.73	3.15	354,108
September.....	5,160	2,240	3,501	1.66	1.85	208,324
October.....	2,272	1,350	1,840	0.872	1.00	113,140
November (1-8 27-30).....	1,734	724	1,308	0.620	0.28	31,133
The period.....	....	....	....	....	18.50	2,083,827

GHOST RIVER AT GILLIES' RANCHE, ALTA.

This station was established on August 17, 1911, by L. R. Brereton. It is located on the N. E. ¼ Sec. 23, Tp. 26, Rge. 6, W. 5th Mer., about one quarter of a mile below Gillies' ranche buildings.

The gauge is a plain staff, graduated to feet and hundredths, nailed to a post sunk in the bed of the stream at the left bank. The zero of the gauge (elev., 90.87) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated on the right bank of the river 270 feet due north of the quarter mound on the east boundary of Sec. 23, Tp. 26, Rge. 6, W. 5th Mer., and 469 feet east and slightly south of the gauge.

Discharge measurements are made from the downstream side of a traffic bridge on the S.E. ¼ Sec. 13, Tp. 26, Rge. 6, W. 5th Mer., about 100 yards from the mouth of the river. The initial point for soundings is the stream face of the west, or right, abutment of the bridge. During very low stages of the stream it can be waded and discharge measurements are then made by wading near the gauge

The channel at the bridge is straight for about 150 feet above and below the station. The right bank is high and composed of solid rock, and cannot overflow. The left is low, composed of gravel, slightly covered with trees, but is not liable to overflow. The bed of the stream is composed of coarse gravel and may shift in high stages.

During 1911 the gauge was read by Miss E. Gillies.

DISCHARGE MEASUREMENTS OF GHOST RIVER AT GILLIES' RANCHE, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 3	H. C. Ritchie...	58.0	81.2	1.60	....	130.0
June 9	R. T. Sailman...	67.0	155.5	1.97	...	305.9
July 13	L. R. Brereton...	89.0	164.4	2.79		457.9
Aug. 18	do	91.0	193.1	3.97	2.46	768.0
Sept. 19	do	70.0	143.4	2.80	1.95	401.1
Oct. 20	do	68.0	124.4	2.46	1.72	305.6
Nov. 9	V. A. Newhall...	52.5	68.5	2.92	1.30	200.0
Nov. 28	do	48.0	75.3	2.94	*	221.6†
Dec. 15	do	51.0	71.6	2.68	*	192.1†

* No gauge.
† Gauging made near the site of gauge. Ice conditions but the probable error small.

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE OF GHOST RIVER AT GILLIES' RANCHE, ALTA., for 1911.

DAY.	August.		September.		October.		November.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2.11	498	1.85	355	1.44	228
2			2.06	465	1.86	359	1.44	228
3			2.43	740	1.86	359	1.49	240
4			3.03	1235	1.85	355	1.52	247
5			2.60	879	1.84	351	1.45	230
6			2.55	838	1.77	324	1.44	228
7			2.31	644	1.77	324	1.45	230
8			2.26	606	1.80	335	1.34	207
9			2.16	532	1.80	335	1.25	191
10			2.15	525	1.80	335	1.25	191
11			2.13	511	1.80	335	1.25	191
12			2.07	472	1.78	328		
13			2.06	465	1.70	300		
14			2.00	429	1.69	297	1.55	
15			1.99	423	1.69	297	1.55	
16			2.00	429	1.67	290	1.45	
17	2.56	846	2.00	429	1.60	269	1.47	
18	2.44	748	1.95	401	1.57	261	1.66	
19	2.44	748	1.95	401	1.55	255	1.66	
20	2.56	846	1.93	391	1.56	258	1.62	
21	2.46	764	1.93	391	1.56	258		
22	2.67	936	1.94	396	1.56	258		
23	2.52	813	1.90	377	1.56	258		
24	2.33	659	1.89	373	1.56	258		
25	2.89	1118	1.90	377	1.56	258		
26	2.67	936	1.94	396	1.56	258		
27	2.45	756	1.96	407	1.45	230		
28	2.37	691	1.93	391	1.44	228		
29	2.31	644	1.89	373	1.44	228		
30	2.20	561	1.86	359	1.44	228		
31	2.16	532			1.45	230		

NOTE.—On Nov. 12, the river was frozen to the bottom of the gauge and the height of water could not be read. A thaw on Nov. 14 caused the water to overflow the ice and on Nov. 20 the gauge was carried out by the ice which broke up. Satisfactory arrangements regarding remuneration could not be made and no observations were therefore reported after Nov. 21. Not sufficient data to compute daily discharge from Nov. 14 to 20.

MONTHLY DISCHARGE OF GHOST RIVER AT GILLIES' RANCHE, ALTA., for 1911.

(Drainage area, 367 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
August (17-31)	1,118	532	773	2.106	1.18	22,998
September	1,235	359	505	1.376	1.54	30,050
October	359	228	291	0.793	0.91	17,893
November (1-11)	247	191	219	0.597	0.24	4,778
The period					3.87	75,719

JUMPINGPOUND CREEK NEAR JUMPING POUND, ALTA.

This station was established in 1906 by J. F. Hamilton. It is located at a traffic bridge on a road diversion on the S. E. $\frac{1}{4}$ Sec. 30, Tp. 24, Rge. 4, W. 5th Mer., and about 300 yards from Jumping Pound P. O.

The channel is straight for about 600 feet above and 500 feet below the station. The current is sluggish at and above the station, but breaks into rapids about 150 feet below the station. The right bank is composed of gravel and boulders, covered with clay, and is not liable to over-

flow. The left bank is similar, but not so high, and is liable to overflow in excessive floods. The bed of the stream is composed of coarse gravel and boulders. It is rough and may shift in flood stages. The stream is divided into several channels during its higher stages by a pier and pile bents supporting the bridge.

At low-water stage of the stream discharge measurements are made at wading sections, either above or below the bridge. During higher stages of the stream, discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the west side of the right abutment. Distances are marked on the railing of the bridge, at every five feet from the initial point.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to the downstream face of the first pile bent west of the main truss of the bridge. The zero (elev., 89.84) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated about thirty feet northeast of the east end of the bridge.

The gauge was read during 1911 by John Bateman, the postmaster at Jumping Pound.

DISCHARGE MEASUREMENTS OF JUMPINGPOUND CREEK AT JUMPING POUND, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Fl. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 2	H. C. Ritchie	77	168.3	0.21	2.02	35.2
June 8	R. T. Sailman	99.8	215.7	0.83	2.56	178.2
July 12	L. R. Brereton	98	209.2	0.62	2.39	130.6
Aug. 16	do	109	268.5	1.30	2.92	350.7
Sept. 14	do	98	208.6	0.66	2.44	137.9
Oct. 19	do	75	169.7	0.36	2.23	60.2

DAILY GAUGE-HEIGHT AND DISCHARGE OF JUMPINGPOUND CREEK AT JUMPING POUND, ALTA., for 1911.

DAY.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	†2.02	30.8	3.30	548	2.98	382	2.35	106	2.56	184	2.47	149
2.....	2.02	30.8	3.20	496	2.99	387	2.53	172	2.54	176	2.49	156
3.....	†2.02	30.8	3.00	392	2.81	297	2.65	223	2.95	366	2.49	156
4.....	2.02	30.8	2.80	292	2.80	292	2.70	246	2.95	366	2.48	152
5.....	2.02	30.8	2.60	201	2.75	269	2.75	269	2.90	341	2.49	156
6.....	2.02	30.8	2.60	201	2.65	223	2.75	269	2.82	302	2.45	141
7.....	2.02	30.8	2.60	201	2.60	201	4.35	1,116	2.72	255	2.43	134
8.....	2.02	30.8	2.56	184	2.55	180	4.50	1,200	2.70	246	2.39	120
9.....	2.02	30.8	2.49	156	2.51	164	4.00	921	2.63	214	2.37	113
10.....	2.02	30.8	2.49	156	2.50	160	3.50	652	2.63	214	2.36	109
11.....	2.02	30.8	2.49	156	2.50	160	3.25	522	2.55	180	2.33	100
12.....	2.02	30.8	2.48	152	2.39	120	3.00	392	2.55	180	2.32	96.4
13.....	2.03	32.2	2.48	152	2.35	106	2.95	366	2.50	160	2.30	90
14.....	2.30	90	2.47	149	2.30	90	2.85	316	2.45	141	2.29	87.2
15.....	2.40	123	2.47	149	2.30	90	3.01	397	2.42	130	2.30	90
16.....	3.00	392	2.45	141	2.28	84.4	2.92	351	2.40	123	2.29	87.2
17.....	2.90	341	2.44	137	2.25	76	2.85	316	2.38	116	2.28	84.4
18.....	2.70	246	2.42	130	2.25	76	2.73	260	2.37	113	2.29	87.2
19.....	2.60	201	2.40	123	2.24	73.4	2.70	246	2.36	109	2.23	70.8
20.....	2.50	160	2.30	90	2.24	73.4	2.60	201	2.36	109		....
21.....	2.40	123	2.21	65.6	2.24	73.4	2.70	246	2.38	116	....	....
22.....	2.50	160	2.15	52	3.30	548	2.70	246	2.40	123	....	....
23.....	2.40	123	2.15	52	3.25	522	2.65	223	2.46	145	....	....
24.....	2.40	123	2.55	180	3.00	392	2.60	201	2.48	152	....	....
25.....	2.40	123	2.91	346	2.78	283	2.73	260	2.49	156	....	....
26.....	2.50	160	2.70	246	2.75	269	2.73	260	2.50	160	....	....
27.....	2.50	160	2.65	223	2.65	223	2.70	246	2.50	160	....	....
28.....	2.40	123	2.95	366	2.56	184	2.68	237	2.52	168	....	....
29.....	2.50	160	2.95	366	2.45	141	2.62	210	2.49	156	....	....
30.....	2.90	341	2.99	387	2.39	120	2.60	201	2.47	149	....	....
31.....	3.00	392	....	....	2.35	106	2.58	193	....	..	....	....

† No observations, gauge height interpolated.

SESSIONAL PAPER No. 25d

MONTHLY DISCHARGE OF JUMPINGPOUND CREEK NEAR JUMPING POUND, ALTA., for 1911.

(Drainage area, 187 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
May	392	30.8	127	0.679	0.78	7,809
June	548	52.0	216	1.155	1.29	12,853
July	548	73.4	205	1.096	1.26	12,605
August	1,200	106.0	357	1.909	2.20	21,951
September	366	109.0	184	0.984	1.10	10,949
October 1-19	156	70.8	115	0.615	0.43	4,334
The period					7.06	70,501

BOW RIVER AT CALGARY, ALTA.

The old station established, May 5, 1908, by P. M. Sauder at the Cushing traffic bridge on the S. E. ¼ Sec. 12, Tp. 24, Rge. 1, W. 5th Mer., was not satisfactory. A new gauging station, was, therefore, established on November 25, 1910, by H. R. Carscallen. It is located at the Langevin traffic bridge, on Fourth Street east, in the N. E. ¼ Sec. 15, Tp. 24, Rge. 1, W. 5th Mer. As the cross-section at the Langevin bridge was affected by some old bridge piers, a plain staff gauge was at first fixed to a breakwater several hundred feet upstream from the bridge, but on November 14, 1911, a chain gauge was established on Langevin bridge and the observations have been made with it since that date.

The river flows in one channel at all stages. It is almost straight for about half a mile above and one quarter of a mile below the station. Both banks are low but are not liable to overflow. The bed of the stream is composed of coarse gravel, and may shift in flood stages of the stream.

Discharge measurements are made from the downstream side of the bridge, which is a two-span steel structure supported by concrete abutments and pier. The initial point for soundings is the south face of the left abutment.

The gauge, which is the standard chain type, is fixed to the floor of the bridge at a point about the centre of the downstream side of the north span of the bridge. The length of the chain from the bottom of the weight to the marker is 22.28 feet. The zero of the gauge is referred to the top of the downstream side of the centre pier of the bridge. The zero of the plain staff gauge on the breakwater (elev., 87.96) was referred to a permanent iron bench-mark (assumed elev., 100.00) situated at the intersection of Second and Third avenues east.

During 1910, the gauge was read by Daniel Hall. During 1911 the gauge was read from January 1 to May 17 by Daniel Hall, from May 21 to July 4 by James Lumley, from July 4 to December 9 by Andrew Brown, and from December 10 to the end of the year by William Peterson.

DISCHARGE MEASUREMENTS OF BOW RIVER AT CALGARY, ALTA., in 1910*-11.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1910		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Nov. 25....	H. R. Carscallen	170.6	491.8	3.22	1.71	1,583†x
Dec. 13....	do	244.8	738.4	1.76	1.67	1,302x
1911						
Jan. 4....	H. R. Carscallen				1.87	600.8^x
Feb. 3....	do	212	311.4	3.02	3.60	942.x
Feb. 22....	do	212	286.3	2.88	3.34	823.4x
Mar. 11....	do	212	370.6	2.68	3.30	832.x
Apr. 24....	H. C. Ritchie	284	755.4	1.90	1.57	1,438
May 8....	do	290.5	901.4	2.66	2.37	2,394
May 15....	do	290.5	881.1	2.63	2.36	2,317
May 26....	do	294	964.8	3.02	2.70	2,916
June 9	B. Russell	307	1,428	4.85	4.15	6,936
June 19	do	320	1,962	6.85	5.68	13,438
July 6....	do	315.8	1,808	5.58	4.82	10,093
Aug. 12....	H. Brown	312	1,658	4.96	4.44	8,224
Aug. 28....	do	293	1,451	3.89	3.76	5,643
Sept. 12....	do	298.8	1,295	3.38	3.30	4,371
Sept. 26....	do	295	1,194	2.79	2.87	3,330
Nov. 23....	N. M. Sutherland	242	795.4	1.95	2.19	1,551x
Dec. 7	do	293	851.7	0.89	4.44	5,754.7x
Dec. 22....	do	277	795.3	0.91	4.39	722.9x

* Other gaugings at the old gauging station in 1910 were published in the Second Annual Report. Data are insufficient to compute daily discharges in November and December of 1910.
† Gauging made at Centre St. bridge.
^ Gauging was made at traffic bridge on sec. 14 and the discharge of Elbow river was deducted to obtain the discharge of Bow river at the regular station.
x Ice conditions.

DAILY GAUGE-HEIGHT AND DISCHARGE OF BOW RIVER AT CALGARY, ALTA., for 1910

DAY.	November		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1....			1.45	1,270
2....			1.60	1,380
3....			1.65	1,410
4....			1.55	1,310
5....			1.62	1,350
6....			1.75	1,450
7....			1.79	1,470
8....			1.97	1,620
9....			1.97	1,600
10....			1.97	1,580
11....			2.05	1,660
12....			1.67	1,300
13....			2.04	1,590
14....			2.05	1,560
15....			1.97	1,470
16....			1.78	1,240
17....			1.85	1,250
18....			1.73	1,130
19....			1.89	1,190
20....			1.80	1,100
21....			1.78	1,050
22....			1.69	970
23....			1.78	980
24....			1.44	810
25....			1.70	880
26....			1.74	860
27....			1.75	820
28....			1.80	810
29....	1.30	1,180	1.80	770
30....	1.40	1,230	1.64	700
31....			1.97	760

NOTE.—Ice conditions during the whole period and daily discharges are therefore only approximate.

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE OF BOW RIVER AT CALGARY, ALTA., for 1911.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.83	690	3.74	960	3.35	840	2 04	800	1 64	1,496	3 87	5,970
2.....	1.70	640	3.65	940	3.30	820	2 47	860	1 70	1,550	4 05	6,600
3.....	1.42	600	3.57	928	3.42	808	2 57	940	1 83	1,670	4 17	7,032
4.....	1 90	600	3.73	1,005	3.40	860	2 44	930	1 84	1,680	4 96	10,144
5.....	2.38	*	3.67	975	3.40	860	2 45	980	1 98	1,836	4 75	9,240
6.....	2.87	...	3.68	980	3.35	840	2 67	1,120	2 25	2,170	4 55	8,450
7.....	3.02	...	3.66	970	3.35	840	2 75	1,200	2 33	2,288	4 32	7,576
8.....	3.73	...	3.67	975	3.37	848	2 57	1 170	2 35	2,320	4 30	7,500
9.....	3 85	...	3 67	975	3.36	844	2 70	1,270	2 37	2,352	4 27	7,392
10.....	3.44	...	3 65	965	3 35	840	2 73	1,330	2 34	2,304	4 12	6,852
11.....	2.95	...	3.65	965	3.35	840	2 64	1,340	2 27	2,198	4 10	6,780
12.....	3.12	...	3.70	990	3.35	840	2 50	1,320	2 24	2,156	4 22	7,212
13.....	3.45	...	3.63	955	3.35	840	2 45	1,340	2 44	2,304	4 57	8,526
14.....	3.80	...	3.55	920	3.40	860	1 84	1,040	2 37	2,352	5 85	14,290
15.....	4.10	...	3.54	916	3 45	880	1 97	1,180	2 37	2,352	5 97	14,890
16.....	4.85	...	3.50	900	3.37	848	2 65	1,300	2 40	2,400	6 05	15,300
17.....	4.86	...	3 57	848	3 57	848	1 87	1,220	2 97	3,534	6 00	15,040
18.....	4.75	...	3.45	880	3.33	832	2 57	1,450	2 94	3,468	5 84	14,240
19.....	4 55	...	3.43	872	3.46	884	1 67	1,190	2 90	3,380	5 75	13,800
20.....	4 46	*	3.24	796	3.60	940	1 70	1,270	2 85	3,270	5 60	13,320
21.....	4.37	1,000	3.43	872	3.56	924	1 76	1,390	2 85	3,270	5 52	13,180
22.....	4 50	990	3.35	840	3.56	924	1 88	1,560	3 00	3,600	5 47	13,150
23.....	4.27	1,000	3.42	808	3.56	924	1 15	1,060	3 05	3,720	5 77	14,340
24.....	4.27	1,020	3.24	796	3.35	840	1 56	1,428	2 97	3,534	6 10	15,740
25.....	4.05	950	3.44	876	3.15	810	2 53	2,288	2 90	3,380	6 25	16,460
26.....	3.93	910	3.44	876	3.08	820	1 73	1,577	2 77	3,094	6 05	15,840
27.....	3.67	830	3.45	880	2 95	810	1 70	1,550	2 69	2,920	5 56	14,080
28.....	3.93	960	3.43	872	2.95	850	1 66	1,514	2 65	2,840	5 47	13,330
29.....	3.94	980	...	...	2.80	830	1 68	1,532	2 59	2,722	5 47	13,330
30.....	3.90	990	...	...	2.82	880	1 67	1,523	2 82	3,204	5 49	13,430
31.....	3.97	1,040	...	...	2.70	870	...	...	3 00	3,600	...	...

DAILY GAUGE-HEIGHT AND DISCHARGE OF BOW RIVER AT CALGARY, ALTA., for 1911.—Con.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5 55	13,730	4 15	7,000	3 65	5,310	2 78	3,116	1 93	1,776	4 30	1,070
2.....	5 45	13,230	4 16	7,040	3 67	5,370	2 75	3,050	1 92	1,764	4 30	980
3.....	5 40	12,980	4 18	7,120	3 70	5,460	2 75	3,050	1 92	1,764	4 52	1,050
4.....	5 30	12,480	4 37	7,908	4 00	6,420	2 73	3,006	1 93	1,776	4 55	990
5.....	5 06	11,280	4 45	8,280	3 97	6,312	2 68	2,900	1 95	1,800	4 53	880
6.....	4 74	9,680	4 45	8,280	3 85	5,910	2 65	2,840	1 95	1,800	4 50	770
7.....	4 77	9,830	5 05	11,230	3 77	5,670	2 75	3,050	1 85	1,690	4 45	744
8.....	5 05	11,230	5 83	15,130	3 65	5,310	2 85	3,270	1 45	1,340	4 40	748
9.....	4 95	10,730	4 97	10,830	3 55	5,020	2 75	3,050	1 43	1,324	4 50	740
10.....	4 75	9,730	4 73	9,630	3 48	4,828	2 42	2,432	1 40	1,300	4 43	746
11.....	4 85	10,230	4 55	8,760	3 45	4,750	2 45	2,480	1 25	1,185	4 51	739
12.....	4 54	8,712	4 45	8,280	3 40	4,620	2 40	2,400	1 20	1,150	4 37	750
13.....	4 42	8,136	4 30	7,600	3 37	4,542	2 42	2,432	0 90	960	4 46	743
14.....	4 40	8,040	4 25	7,400	3 35	4,490	2 40	2,400	1 32	1,200	4 47	742
15.....	4 58	8,904	4 23	7,320	3 32	4,412	2 23	2,142	1 50	1,295	4 25	760
16.....	4 53	8,664	4 20	7,200	3 32	4,412	2 18	2,076	2 00	1,700	4 47	742
17.....	4 60	9,000	4 15	7,000	3 25	4,230	2 43	2,448	2 35	2,080	4 37	750
18.....	4 65	9,240	4 00	6,420	3 23	4,178	2 40	2,400	2 47	2,200	4 32	754
19.....	4 67	9,336	4 00	6,420	3 20	4,100	2 30	2,240	2 48	2,160	4 25	760
20.....	4 57	8,856	3 97	6,312	3 05	3,720	2 17	2,064	2 48	2,120	4 32	754
21 ..	4 52	8,616	3 95	6,240	3 10	3,840	2 25	2,170	2 45	2,010	4 37	750
22...	4 53	8,664	3 95	6,240	3 05	3,720	2 15	2,040	2 37	1,840	4 34	753
23.....	4 55	8,760	3 90	6,060	3 00	3,600	2 17	2,064	2 35	1,720	4 35	752
24.....	4 45	8,280	3 85	5,910	2 97	3,534	2 20	2,100	2 35	1,740	4 55	736
25.....	4 40	8,040	3 85	5,910	2 95	3,490	2 23	2,142	2 30	1,660	4 67	726
26.....	4 46	8,328	3 90	6,060	2 90	3,380	2 25	2,170	2 25	1,610	4 75	720
27.....	4 55	8,760	3 85	5,910	2 88	3,336	2 13	2,016	2 23	1,590	5 51	659
28.....	4 40	8,040	3 75	5,610	2 85	3,270	2 10	1,980	4 28	1,360	5 35	672
29.....	4 25	7,400	3 70	5,460	2 80	3,160	2 10	1,980	4 27	1,230	5 15	688
30.....	4 23	7,320	3 63	5,250	2 80	3,160	1 97	1,824	4 25	1,120	5 35	672
31.....	4 15	7,000	3 70	5,460	....	....	1 95	1,800	....	....	5 62	650

* Not sufficient data to compute daily discharge from Jan. 5 to Jan. 20.

NOTE:—Ice conditions during January, February, March, November and December. Daily discharges for those months are only approximate, particularly December which may be a little low.

MONTHLY DISCHARGE OF BOW RIVER NEAR CALGARY, ALTA., for 1910-11.

(Drainage area, 3138 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1910						
November 29-30.....	1,230	1,180	1,205	0 348	0 03	4,780
December.....	1,660	700	1,205	0 384	0 44	74,093
The period					0 47	78,873
1911						
January (1-4) 21-30.....	1,040	600	880	0 280	0 16	26,182
February.....	1,005	796	914	0 291	0 30	50,761
March.....	940	810	857	0 273	0 31	52,695
April.....	2,288	860	1,292	0 412	0 46	76,879
May.....	3,720	1,496	2,676	0 852	0 98	164,541
June.....	16,460	5,970	11,434	3 640	4 06	680,370
July.....	13,730	7,000	9,459	3 010	3 47	581,611
August.....	15,130	5,250	7,396	2 360	2 72	454,762
September.....	6,420	3,160	4,452	1 420	1 58	264,912
October.....	3,270	1,800	2,424	0 772	0 89	149,046
November.....	2,200	960	1,609	0 513	0 57	95,740
December.....	1,070	650	774	0 247	0 28	47,591
The period					15 78	2,645,090

ELBOW RIVER AT CALGARY, ALTA.

This station was established May 8, 1908, by P. M. Sauder. It is located near the old General Hospital in Calgary, in the S. W. ¼ Sec. 14, Tp. 24, Rge. 1, W. 5th Mer. There are no tributaries below this station, and there is no water diverted from the river except that used by the City of Calgary, whose intake is about eleven miles upstream.

The stream is confined to one channel. The left bank is high and does not overflow. The right bank is covered with brush, and may overflow at extreme flood-stage of the stream. The bed of the stream is composed of boulders and gravel and is not liable to change at the station, but may do so further up the stream where there is a small ripple. The channel is straight for about 500 feet below and above the station. The current is slow in low-water stages of the stream but fairly swift in the higher stages.

Discharge measurements are made by means of a cable-car, tagged wire, and stay wire. The initial point for soundings is the zero of the tagged wire, at its fastening to the cable support, on the left bank.

The original gauge was a plain staff graduated to feet and hundredths, attached to a twelve-inch post sunk in the bed of the stream at the left bank. The zero of the gauge (elev., 83.51) is referred to a permanent iron bench-mark (assumed elev., 100.00) which is situated about twenty-five feet south of the cable support on the left bank.

After November 14 gauge-height observations were made with a chain gauge established on that date by H. R. Carscallen on the upstream side of the new traffic bridge spanning Elbow River between Eleventh and Twelfth avenues east. The zero (elev., 84.75) is referred to a bench-mark (assumed elev., 100.00) on the extreme upstream corner of the cement wing-wall of the left abutment of the bridge. The length of the chain from the bottom of the weight to the marker is 16.03 feet.

During 1911 the gauge was read once each day by Mrs. I. S. White.

It is estimated by J. T. Child, City Engineer, that the City of Calgary diverted an average of 11 cubic feet per second during 1911.

DISCHARGE MEASUREMENTS OF ELBOW RIVER AT CALGARY, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 5	H. R. Carscallen	120.0	193 1	0 33	1 10	64.0†
Jan. 16	do	120.0	181 1	0 25	0 90	45.1†
Feb. 6	do	120.0	215 8	0 40	1 97	85 4†
Feb. 18	do	100.0	204 0	0 54	2 22	111 0†
Mar. 14	do	100.0	178 3	0 58	2 05	103.6†
Apr. 6	do	85.0	143 0	0 64	0 33	90 9†
Apr. 15	do	123.0	249 5	0 66	0 57	165 3
May 1	H. C. Ritchie.	133.0	269 2	0 79	0 68	211.5
May 25	do	137.5	346 2	1 22	1 21	422.5
June 5	B. Russell	148.0	457 3	2 06	2 01	942 4
June 21	do	144 0	395 6	1 65	1 59	654 5
July 5	do	142.5	441 6	1 93	1 90	852.6
Aug. 3	H. T. Thomas.	140.0	394 6	1 59	1 56	629.6
Aug. 9	H. Brown.	150.5	675 1	3 63	3 46	2,385.0
Aug. 23	do	139.0	410 8	1 67	1 66	686.4
Sept. 8	do	142.5	461 6	2 10	2 01	967.6
Sept. 25	do	135.5	347 8	1 30	1 33	453.1
Oct. 18	B. Russell	132.0	331 8	1 04	1 08	344.5
Nov. 21	N. McL. Sutherland	127.0	279 1	0 82	2 24*	229.1†
Dec. 6	do	115.0	241 2	0 40	2 30*	95 8†
Dec. 23	do	105.0	206 2	0 73	2 10*	131 1†

* New chain gauge. † Ice conditions.

DAILY GAUGE-HEIGHT AND DISCHARGE OF ELBOW RIVER AT CALGARY, ALTA., for 1911

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1 06	71	1 78	73	2 30	128	0 55	81	0 71	209	2 61	1,466
2	0 99	65	1 79	74	2 26	123	0 45	79	0 68	201	2 51	1,370
3	0 90	60	1 86	78	2 25	122	0 42	82	0 66	196	2 37	1,244
4	0 87	54	1 89	79	2 25	123	0 38	84	0 64	190	2 25	1,139
5	1 09	64	1 96	85	2 26	125	0 51	102	0 73	215	2 09	1,006
6	1 12	64	2 00	88	2 23	121	0 47	105	0 73	215	1 83	857
7	1 25	69	1 95	84	2 26	126	0 60	147	0 74	218	1 74	743
8	1 34	71	2 03	91	2 25	125	0 49	143	0 78	230	1 69	708
9	1 19	63	1 99	87	2 21	121	0 47	172	0 76	224	1 65	682
10	1 05	57	1 96	85	2 22	122	0 67	198	0 71	209	1 61	655
11	0 90	51	1 98	86	2 17	116	0 63	188	0 71	209	1 78	771
12	0 76	48	2 02	90	2 09	107	0 89	207	0 68	201	1 59	926
13	0 79	47	2 03	91	2 14	114	0 80	236	0 78	230	2 21	1,105
14	0 74	45	2 00	88	2 08	107	0 67	198	1 02	319	2 17	1,071
15	0 99	48	2 07	95	2 08	116	0 69	203	0 98	302	2 09	1,006
16	0 90	45	2 03	91	2 09	128	0 79	233	1 18	392	2 02	950
17	1 01	47	2 10	98	1 96	118	0 92	278	1 97	911	1 97	911
18	1 59	64	2 21	110	1 92	123	0 87	260	1 75	750	1 85	821
19	1 59	64	2 16	104	1 86	124	0 84	250	1 59	641	1 70	715
20	1 60	64	2 10	98	1 82	128	0 98	302	1 40	526	1 65	682
21	1 68	68	2 12	101	2 26	255	1 30	458	1 36	495	1 59	641
22	1 69	68	2 23	115	1 97	191	1 43	539	1 32	470	1 58	635
23	1 72	70	2 27	120	1 92	199	1 17	388	1 33	477	1 67	695
24	1 69	68	2 19	111	1 84	192	1 16	383	1 29	452	1 76	757
25	1 68	68	2 16	108	1 81	203	1 10	354	1 28	447	2 40	1,270
26	1 75	72	2 20	113	1 70	193	1 06	336	1 25	430	1 99	926
27	1 64	66	2 23	119	1 60	185	0 99	306	1 22	413	1 95	896
28	1 74	71	2 27	123	1 55	189	0 89	267	1 22	413	2 00	934
29	1 75	72	.	.	1 40	170	0 80	236	1 43	539	2 02	950
30	1 76	72	.	.	0 90	90	0 73	215	1 86	829	2 05	974
31	1 78	73	.	.	0 69	86	.	.	2 16	1,063	.	.

DAILY GAUGE-HEIGHT AND DISCHARGE OF ELBOW RIVER AT CALGARY, ALTA., for 1911.—*Con.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.33	1,208	1.25	430	1.50	583	1.30	458	0.95	290	2.08	87
2.....	2.31	1,191	1.55	615	1.47	564	1.29	452	0.93	282	2.07	70
3.....	2.10	1,014	1.60	648	1.45	552	1.32	470	0.92	278	2.15	91
4.....	1.99	926	1.80	785	2.69	1,546	1.30	458	0.92	278	2.10	75
5.....	1.88	843	1.89	851	2.40	1,270	1.29	452	0.90	270	2.11	70
6.....	1.75	750	1.90	858	2.25	1,139	1.28	447	0.84	250	2.28	92
7.....	1.70	715	2.31	1,191	2.16	1,063	1.26	436	0.80	236	2.16	76
8.....	1.64	675	4.05	3,159	2.08	998	1.24	424	0.49	157	2.07	75
9.....	1.61	655	3.35	2,252	1.99	926	1.21	408	0.14	103	2.05	64
10.....	1.55	615	2.91	1,769	1.93	881	1.18	392	†	85	2.16	90
11.....	1.48	570	2.69	1,546	1.89	851	1.14	373	†	75	2.28	129
12.....	1.42	533	2.41	1,279	1.84	814	1.13	368	†	80	2.35	146
13.....	1.35	489	2.30	1,182	1.77	764	1.12	364	†	100	2.20	114
14.....	1.31	464	2.15	1,055	1.68	702	1.11	359	2.02*	120	2.06	85
15.....	1.33	477	2.00	934	1.61	655	1.10	354	2.15	183	2.05	89
16.....	1.38	508	2.18	1,080	1.56	622	1.10	354	2.46	377	2.07	97
17.....	1.35	489	1.93	881	1.55	615	1.08	345	2.34	293	2.35	196
18.....	1.33	477	1.78	771	1.48	570	1.06	336	2.35	300	2.20	150
19.....	1.51	590	1.67	695	1.43	539	1.05	332	2.36	307	1.91	61
20.....	1.47	564	1.91	866	1.41	526	1.05	332	2.37	314	2.10	130
21.....	1.41	526	1.75	750	1.38	508	1.03	323	2.24	231	2.27	207
22.....	1.39	514	1.73	736	1.37	501	1.03	323	2.44	340	1.99	100
23.....	1.65	682	1.69	708	1.37	501	1.04	328	2.18	180	2.08	143
24.....	1.59	641	1.64	675	1.35	489	1.04	328	2.19	175	2.23	225
25.....	1.48	570	1.61	655	1.33	477	1.03	323	2.25	192	1.99	107
26.....	1.41	526	1.75	750	1.33	477	1.02	319	2.26	185	1.76	31
27.....	1.45	552	1.70	715	1.32	470	1.02	319	2.49	270	1.79	38
28.....	1.39	514	1.67	695	1.32	470	1.01	314	2.20	144	1.79	38
29.....	1.31	464	1.62	661	1.32	470	0.99	306	2.28	162	1.76	31
30.....	1.28	447	1.59	641	1.31	464	0.98	302	2.12	105	1.76	31
31.....	1.26	436	1.54	609	.....	.....	0.95	290	.....	...	2.08	149

† No observation, gauge height interpolated.
‡ Water below zero of gauge.
* Chain gauge installed.
NOTE—Ice conditions during January, February, March, November and December. Daily discharges for those months are only approximate.

MONTHLY DISCHARGE OF ELBOW RIVER AT CALGARY, ALTA., for 1911.

(Drainage area, 482 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January.....	73	45	62.2	0.129	0.15	3,824
February.....	123	73	95.9	0.199	0.21	5,326
March.....	255	86	141.0	0.293	0.34	8,670
April.....	539	79	236.0	0.490	0.55	14,043
May.....	1,063	190	407.0	0.844	0.97	25,025
June.....	1,466	635	915.0	1.898	2.12	54,446
July.....	1,208	436	633.0	1.313	1.51	38,922
August.....	3,159	430	982.0	2.037	2.35	60,381
September.....	1,546	464	700.0	1.452	1.62	41,653
October.....	470	290	367.0	0.761	0.88	22,566
November.....	377	75	212.0	0.440	0.49	12,615
December.....	225	31	100.0	0.207	0.24	6,149
The year.....						293,620

NOSE CREEK NEAR CALGARY, ALTA.

This station was established April 24, 1911, by H. C. Ritchie. It is located at the traffic bridge on the N. W. ¼ Sec. 13, Tp. 24, Rgc. 1, W. 5th Mer. The station is about one and a half miles east of the centre of the city and about one quarter of a mile above the junction of Nose Creek with Bow River.

Discharge measurements are made from the downstream side of the bridge at high stages and at a wading section downstream in low water.

The channel is straight for about 50 feet above and 150 feet below the station. A small island just below the bridge divides the stream into two channels in low water and causes cross-currents at the bridge. Both banks are high, steep, gravelly and clear of brush. The bed of the stream is composed of coarse gravel.

The gauge is a plain staff graduated to feet and hundredths, spiked to the upstream face of the upper pile of a row near the left bank. The zero (elev., 92.83) is referred to a permanent iron bench-mark (assumed elev., 100.00 feet) on the left bank near the end of the bridge.

The gauge was read once each day, by A. N. Baily.

DISCHARGE MEASUREMENTS OF NOSE CREEK, NEAR CALGARY, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Fl. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 5 . . .	H. C. Ritchie.....	16.0	5.8	1.08	1.59	6.2
May 17.....	do	24.5	31.9	1.65	2.00	52.9
May 29.....	do	23.5	25.2	1.32	1.85	33.2
June 8 . . .	B. Russell.....	22.5	21.7	0.80	1.75	17.4
July 5.....	do	18.9	14.6	0.44	1.65	6.4
Aug. 2 . . .	H. T. Thomas.....	14.6	7.9	0.66	1.56	5.2
Aug. 24 . . .	H. Brown	16.1	9.7	0.91	1.66	8.8
Sept. 13.....	do	16.3	10.7	0.63	1.65	6.7
Sept. 27.....	do	16.9	44.5	0.21	1.67	9.3

DAILY GAUGE-HEIGHT AND DISCHARGE OF NOSE CREEK, NEAR CALGARY, ALTA., for 1911.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			1.62	7.2	1.74	16.2	1.75	17.4
2			1.64	7.9	1.70	11.5	1.73	15.0
3			1.60	6.5	1.75	17.4	1.65	8.3
4			1.62	7.2	1.76	18.6	1.65	8.3
5			1.60	6.5	1.70	11.5	1.60	6.5
6			1.70	11.5	1.68	10.2	1.62	7.2
7			1.71	12.7	1.70	11.5	1.60	6.5
8			1.65	8.3	1.76	18.6	1.58	5.9
9			1.68	10.2	1.75	17.4	1.63	7.6
10			1.63	7.6	1.73	15.0	1.67	9.6
11			1.63	7.6	1.69	10.9	1.70	11.5
12			1.65	8.3	1.65	8.3	1.66	8.9
13			1.76	18.6	1.68	10.2	1.70	11.5
14			1.80	23.6	2.35	1.10	1.68	10.2
15			1.75	17.4	2.30	1.02	1.63	7.6
16			1.80	23.6	2.15	77.2	1.57	5.7
17			2.20	85.3	1.89	36.2	1.59	6.2
18			2.10	69.1	1.90	37.6	1.63	7.6
19			1.90	37.6	1.75	17.4	1.68	10.2
20			1.80	23.6	1.65	8.3	1.71	12.7
21			1.82	26.3	1.63	7.6	1.68	10.2
22			1.73	15.0	1.60	6.5	1.65	8.3
23			1.80	23.6	1.63	7.6	1.70	11.5
24	1.75	17.4	1.85	30.4	2.00	52.9	1.67	9.6
25	1.78	21.1	1.70	11.5	2.32	105	1.65	8.3
26	1.73	15.0	1.68	10.2	2.25	93.5	1.63	7.6
27	1.68	10.2	1.79	22.4	1.80	23.6	1.60	6.5
28	1.65	8.3	1.88	34.7	1.73	15.0	1.60	6.5
29	1.65	8.3	1.83	27.7	1.73	15.0	1.59	6.2
30	1.60	6.5	1.77	19.9	1.75	17.4	1.58	5.9
31			1.75	17.4			1.58	5.9

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE OF NOSE CREEK, NEAR CALGARY, ALTA., for 1911.—*Con.*

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis- charge.	Gauge Height	Dis- charge.	Gauge Height	Dis- charge	Gauge Height.	Dis- charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1....	1.60	6.5	1.65	8.3	1.65	8.3	1.58	5.9
2....	1.60	6.5	1.65	8.3	1.66	8.9	1.58	5.9
3....	1.60	6.5	1.66	8.9	1.66	8.9	1.59	6.2
4....	1.64	7.9	1.75	17.4	1.67	9.6	1.60	6.5
5....	1.70	11.5	1.75	17.4	1.66	8.9	1.58	5.9
6....	1.68	10.2	1.70	11.5	1.66	8.9	1.58	5.9
7....	1.72	13.9	1.69	10.9	1.65	8.3	1.57	5.7
8....	1.85	30.4	1.67	9.6	1.65	8.3	1.57	5.7
9....	1.93	42.1	1.65	8.3	1.65	8.3	1.57	5.7
10....	1.79	22.4	1.67	9.6	1.65	8.3	1.57	5.7
11....	1.78	21.1	1.67	9.6	1.65	8.3	1.57	5.7
12....	1.75	17.4	1.68	10.2	1.64	7.9	1.57	5.7
13....	1.66	8.9	1.68	10.2	1.63	7.6	1.57	5.7
14....	1.65	8.3	1.67	9.6	1.62	7.2	1.57	5.7
15....	1.70	11.5	1.68	10.2	1.61	6.9	1.57	5.7
16....	1.75	17.4	1.65	8.3	1.60	6.5		
17....	1.80	23.6	1.64	7.9	1.60	6.5		
18....	1.75	17.4	1.65	8.3	1.59	6.2		
19....	1.75	17.4	1.65	8.3	1.58	5.9		
20....	1.71	12.7	1.65	8.3	1.59	6.2		
21....	1.68	10.2	1.66	8.9	1.59	6.2		
22....	1.68	10.2	1.68	10.2	1.60	6.5		
23....	1.67	9.6	1.70	11.5	1.62	7.2		
24....	1.69	10.9	1.69	10.9	1.63	7.6		
25....	1.71	12.7	1.68	10.2	1.63	7.6		
26....	1.75	17.4	1.65	8.3	1.61	6.9		
27....	1.73	15.0	1.65	8.3	1.61	6.9		
28....	1.75	17.4	1.65	8.3	1.60	6.5		
29....	1.70	11.5	1.66	8.9	1.59	6.2		
30....	1.68	10.2	1.66	8.9	1.59	6.2		
31....	1.65	8.3			1.58	5.9		

MONTHLY DISCHARGE OF NOSE CREEK NEAR CALGARY, ALTA., for 1911.

(Drainage area, 294 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April 24-30.....	21.1	6.5	12.4	0.042	0.01	172
May.....	85.3	6.5	20.6	0.070	0.08	1,267
June.....	110.0	6.5	30.3	0.103	0.12	1,803
July.....	17.4	5.7	8.7	0.030	0.03	535
August.....	42.1	6.5	14.4	0.049	0.06	885
September.....	17.4	7.9	9.8	0.033	0.04	583
October.....	9.6	5.9	7.4	0.025	0.03	455
November (1-15).....	6.5	5.7	5.8	0.020	0.01	173
The period.....					0.38	5,873

CANADIAN PACIFIC RAILWAY COMPANY CANAL NEAR CALGARY, ALTA.

This station was established on May 18, 1911, by H. C. Ritchie. It is located at a bridge (No. 3) on the north side of the N. E. ¼ Sec. 21, Tp. 23, Rge. 29, W. 4th Mer., and is about six miles from the intake of the canal.

The channel is straight for about 300 feet above and 500 feet below the station. The banks are high, composed of clay and cut to a uniform slope. The bed is also composed of clay. The current is moderate and uniform.

Discharge measurements are made from the downstream side of the bridge, which is a wooden structure supported by piles. The initial point for soundings is a spike driven into the rail at the inner face of the left abutment.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to the downstream side of one of the piles supporting the bridge. It is referred to two bench-marks as follows: (1) an iron post in the left bank two feet from the lower end of the left abutment; elevation, 14.31 feet above the datum of the gauge; (2) the top of the downstream end of the sill capping the piles of the left abutment; elevation, 14.55 feet above the datum of the gauge.

The gauge-height observations for 1911 were supplied by the Canadian Pacific Railway Company, A. Hatcher taking the reading once each day for the company.

DISCHARGE MEASUREMENTS OF CANADIAN PACIFIC RAILWAY COMPANY CANAL NEAR CALGARY, ALTA., for 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Apr. 17	H. C. Ritchie	63.0	57.9	2.35	....	136.3*
May 5	do	64.5	85.8	2.47	....	212.1*
May 18	do	44.5	45.6	1.26	1.87	57.6
June 6	B. Russell	53.0	87.3	1.84	2.60	161.1
July 10	do	59.5	190.4	2.11	3.75	401.5†
Aug. 4	H. T. Thomas	56.4	101.2	1.44	2.60	145.3†
Aug. 24	H. Brown	46.5	55.8	1.27	2.00	70.8
Sept. 13	do	56.2	125.3	2.30	3.29	288.8
Sept. 22	L. R. Brereton	50.0	75.8	1.61	2.40	122.3

* Gauging made at a wading section near the intake. Water was turned into the canal for a few days in April to fill the pool in the canal.
† Gauging made at a bridge (No. 1.) on the north side of Sec. 36, Tp. 23, Rge. 1, W. 5th Mer.

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE OF CANADIAN PACIFIC RAILWAY COMPANY CANAL NEAR CALGARY, ALTA., for 1911.

DAY.	April.		May.		June.		July.		August.		September.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.10	83	2.40	122	3.15	259	2.60	154	2.25	101
2.....			2.40	122	2.43	127	3.15	259	2.60	154	2.30	108
3.....			3.10	248	2.47	133	3.15	259	2.60	154	2.35	115
4.....			3.00	228	2.87	1202	3.15	259	2.60	154	3.85	415
5.....			3.00	228	2.57	149	3.15	259	2.60	154	3.90	441
6.....			3.00	228	2.57	149	3.15	259	2.75	180	3.90	441
7.....			3.00	228	2.57	149	3.10	248	2.85	198	3.85	428
8.....			3.00	228	2.57	149	3.00	228	2.80	180	3.85	428
9.....			3.00	228	2.72	141	3.00	228	2.80	180	2.90	208
10.....			3.00	228	2.50	138	3.75	402	2.75	180	2.85	198
11.....			3.00	228	2.58	151	3.85	428	2.75	180	2.85	198
12.....			2.80	180	2.56	148	3.60	364	2.75	180	2.85	198
13.....			2.60	171	2.70	171	3.00	304	2.85	180	3.10	248
14.....			2.70	171	2.90	208	3.40	316	2.90	208	3.15	259
15.....			2.55	146	2.95	218	3.40	316	2.80	180	3.15	259
16.....			2.45	130	2.95	218	3.40	316	2.60	154	3.00	228
17.....			2.25	101	3.75	352	3.45	328	2.50	138	2.85	198
18.....			2.15	89	3.53	347	3.45	328	2.50	138	2.85	198
19.....			1.70	43	3.53	347	3.45	328	2.50	138	2.85	198
20.....			2.65	162	3.80	415	3.45	328	2.50	138	2.80	180
21.....			2.60	154	3.50	415	3.45	328	2.50	138	2.50	138
22.....			2.60	154	3.95	454	3.00	228	2.45	130	2.40	122
23.....			2.25	101	3.95	454	3.00	228	2.45	130	2.40	122
24.....			2.20	95	4.00	467	3.00	228	2.25	101	2.40	122
25.....			2.20	95	3.45	328	2.05	218	2.20	95	2.40	122
26.....			2.20	95	3.45	328	2.90	208	2.20	95	3.80	415x
27.....			2.22	97	3.45	328	2.70	171	2.20	95	3.85	428x
28.....			2.20	95	3.45	328	2.70	171	2.20	95	0.75	0.00
29.....			2.20	95	3.20	270	2.70	171	2.00	71		
30.....	1.65	39	2.20	95	3.20	270	2.60	154	2.00	71		
31.....			2.30	108			2.60	154	2.00	71		

* Opened one gate at 7.00 p.m.
† Closed one gate at 8.30 p.m.
x Water shut off at intake for the season.
NOTE—Water was turned into the canal for a few days about the middle of April to fill the pool in the canal. Canal was opened for the irrigation season on April 30. Gauge heights from April 30 to May 17 were interpolated from observations made at bridge No. 2.

MONTHLY DISCHARGE OF CANADIAN PACIFIC RAILWAY COMPANY CANAL NEAR CALGARY, ALTA., for 1911.

MONTH.	DISCHARGE IN SECOND-FEET.			Total Discharge in acre-feet.
	Maximum.	Minimum.	Mean.	
April (30).	39	39	39	77
May.....	248	43	150	9,223
June.....	467	122	256	15,233
July.....	428	154	260	16,540
August.....	208	71	144	8,854
September 1-28	441	0	230	12,774
The period (April 30 to Sept. 28).				62,701

FISH CREEK NEAR PRIDDIS, ALTA.

This station was established May 13, 1907, by P. M. Sauder. It is on the S. W. $\frac{1}{4}$ Sec. 26, Tp. 22, Rge. 3, W. 5th Mer., about one mile from Priddis and near Percival's buildings. A plain staff gauge, graduated to feet and hundredths, is placed vertically at the left bank, about 200 yards north of Mr. Percival's house. The zero of the gauge (elev., 90.81) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated 36 feet west and a little south of the gauge.

The channel is straight for 300 feet above and 150 feet below the station. The left bank is high, and will not overflow. The right bank is low, covered with brush and timber, and is liable to overflow in extreme high water. The bed is composed of gravel, but not liable to shift. The current is sluggish in extreme low stage of the stream.

Measurements are made by wading at or near the gauge, during low-water stages of the stream, and high-water stages are computed from slope measurements by the use of Kutter's formula. It is proposed to establish a cable station at this point for high-water measurements. During 1911, the gauge was read by Fred Percival.

DISCHARGE MEASUREMENTS OF FISH CREEK NEAR PRIDDIS, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Apr. 27.....	H. R. Carscallen	37	40.5	0.60	1.26	24.3
June 3	J. C. Milligan	42	62.0	1.26	1.85	77.8
June 13.....	R. T. Sailman	38	51.9	0.72	1.48	37.4
July 18.....	L. R. Brereton	37	46.0	0.58	1.36	27.0
Aug. 23.....	do	49	66.3	0.85	1.70	56.4
Sept. 27.....	do	49.5	71.4	0.93	1.79	66.8

DAILY GAUGE-HEIGHT AND DISCHARGE OF FISH CREEK NEAR PRIDDIS, ALTA., for 1911.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1 70	58.0	1 00	12 0	1 80	69.0	2 70	220.0
2.....	1 70	58 0	1 00	12 0	1 99	93.6	2 80	242 0
3.....	1 70	58 0	0 96	10 4	1 90	81.0	2 10	109.0
4.....	1 74	62 0	0 96	10 4	1 90	81.0	2 09	108 0
5.....	1 74	62 0	0 96	10 4	1 80	69.0	2.09	108.0
6.....	1 78	66.6	0 99	11 6	1 60	48.0	1 80	69.0
7.....	1 78	66 6	1 04	13 6	1 65	53.0	1 71	59 0
8.....	1 82	71 4	0 93	9 4	1 66	54 0	1 68	56.0
9.....	1 82	71 4	0 93	9 4	1 73	61.0	1 68	56 0
10.....	2 00	95 0	0 93	9 4	1.60	48.0	1 70	58.0
11.....	2 00	95 0	0 89	8 2	1.60	48.0	1.73	61.0
12.....	2 00	95 0	0 88	7 9	1 45	36.0	1.71	59 0
13.....	1 66	54 0	0 88	7 9	1.61	49.0	1 71	59.0
14.....	1 46	36 8	1 58	46 4	1 60	48.0	1 44	35.4
15.....	1 87	77.4	2 22	128 0	1 50	40.0	1 44	35.4
16.....	1 87	77 4	2 60	200 0	1 50	40.0	1 40	33.0
17.....	1 87	77 4	3 02	293 0	1 50	40.0	1 40	33.0
18.....	1 70	58 0	2 55	190 0	1 31	27.6	1.51	40.8
19.....	1 70	58 0	1 95	88 0	1 30	27.0	1 90	81.0
20.....	1 65	53 0	1.70	58.0	1.30	27.0	1 70	58 0
21.....	1 63	51 0	1 60	48 0	1 22	22.2	1 60	48.0
22.....	1 65	53 0	1 60	48 0	1 22	22.2	1 60	48.0
23.....	1 53	42 4	1 40	33 0	1 33	28 8	1.60	48.0
24.....	1 53	42 4	1.39	32 4	1 38	31.8	1 48	38.4
25.....	1 53	42 4	1.39	32.4	1 55	44.0	1.39	32.4
26.....	1 33	28 8	1.60	48 0	1 65	53.0	1 35	30.0
27.....	1 28	25 8	1 60	48 0	1 75	63.0	1.31	27.6
28.....	1 23	22 8	2 60	200 0	1 90	81.0	1 26	24.6
29.....	1 23	22 8	2 70	220 0	2 00	95.0	1.26	24 6
30.....	1.23	22 8	2 40	160 0	2 60	200.0	1 26	24.6
31.....	.....	.....	2 04	101 0	.....	.....	1 26	24.6

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE OF FISH CREEK NEAR PRIDDIS, ALTA., for 1911.—*Con.*

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1. . .	1.25	24 0	1.50	40.0	1.56	44.8	1 35	30.0
2. . .	1.25	24 0	1 45	36.0	1 56	44 8	1 35	30.0
3. . .	1.25	24 0	1 70	58.0	1 60	48.0	1 25	24.0
4. . .	1.26	24 6	2 10	109 0	1 71	59 0	1 20	21.0
5. . .	1.48	38 4	2 00	95.0	1 65	53 0	1 20	21.0
6. . .	1.60	48 0	2 10	109.0	1.56	44 8	1 20	21.0
7. . .	2 40	160 0	1 80	69.0	1 55	44 0	1 21	21.6
8. . .	5.00	930 0	1 80	69.0	1.55	44 0	1 20	21.0
9. . .	3.70	471 0	1 65	53.0	1 45	36 0	1 25	24.0
10. . .	3.00	288 0	1 60	48.0	1 44	35 4	1 25	24.0
11.	2.70	220 0	1 60	48.0	1.44	35.4	1 25	24.0
12.	2.40	160 0	1 50	40.0	1 43	34 8	1 25	24.0
13.	2.30	142 0	1 45	36.0	1.37	31 2	1 25	24.0
14.	2 00	95 0	1 45	36.0	1.36	30 6	1 25	24.0
15.	1.95	88 0	1 43	34.8	1.35	30 0	1 25	24.0
16.	2.30	142 0	1 35	30.0	1 35	30 0	1 25	24.0
17.	2.15	117 0	1 45	36.0	1.35	30 0		
18.	1.95	88 0	1 45	36.0	1 30	27 0		
19.	1.90	81 0	1 35	30.0	1 32	28 2		
20.	1.80	69 0	1 34	29.4	1 35	30 0		
21.	1 80	69 0	1 40	33 0	1 35	30 0		
22.	1.75	63 0	1 50	40.0	1 33	28 8		
23.	1.70	58 0	1 55	44.0	1 33	28 8		
24.	1.65	53 0	1 55	44.0	1 33	28 8		
25.	1.70	58 0	1 56	44.8	1 25	24 0		
26.	1.85	75 0	1 64	52.0	1 58	46 4		
27.	1.85	75 0	1 75	63.0	1 71	59 0		
28.	1.75	63 0	1 77	65 4	1 70	58 0		
29.	1.60	48 0	1 80	69.0	1 55	44 0		
30.	1 60	48 0	1 65	53.0	1 25	24 0		
31.	1.51	40 8			1 25	24 0		

MONTHLY DISCHARGE OF FISH CREEK NEAR PRIDDIS, ALTA., for 1911.

(Drainage area, 109 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square mile.	Depth in inches in Drainage area.	Total in acre-feet.
April	95	22 8	56 8	0 521	0 58	3,380
May.	293	7 9	68.0	0 624	0 72	4,181
June.	200	22 2	56 0	0 514	0 57	3,332
July.	242	24 6	62.9	0 577	0 67	3,868
August.	930	24 0	125.0	1 147	1 32	7,686
September.	109	29 4	51.7	0 474	0 53	3,076
October.	59	24 0	37.3	0 342	0 39	2,294
November (1-16).	30	21 0	23.8	0 218	0 13	755
The period.					4 91	28,572

NORTH BRANCH OF SHEEP RIVER AT MILLARVILLE, ALTA.

This station was established May 22, 1908, by P. M. Sauder. It is located on the S. W. 14 Sec. 12, Tp. 21, Rge. 3, W. 5th Mer., 100 feet from Malcolm T. Millar's house, Millarville P.O.

Discharge measurements are made at the traffic bridge about one mile downstream on the road allowance on the east boundary of Sec. 12. At low stages the stream is gauged at a wading section about 100 yards downstream from the gauge. The cross-section at the gauge is unsuitable for measurements, the stream being very deep and sluggish at this point.

Owing to the speed of the current above and below the station and the instability of the stream-bed, the factors governing the relation of gauge-height to discharge are continually changing, especially in high stages of the stream. During 1911, an exceptional amount of rainfall resulted in a series of high-water periods. In consequence, the stream changed to such an extent that the data accumulated were found insufficient for the compilation of daily discharges. The gauge, which is a plain staff, graduated to feet and hundredths, is nailed to the crib-work at the left side of the stream, constructed by Mr. Millar for the preservation of the creek bank. The zero (elev., 82.67) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated 36 feet southwest of the N.E. corner of Sec. 2, Tp. 21, Rge. 3, W. 5th Mer., and about 100 yards west of the gauge. The high water in August, 1911, carried away the original gauge and on the 24th of the month a new gauge was installed in the same position as the former gauge but at elev. 81.40. During 1911, the gauge was read once daily by Malcolm T. Millar.

DISCHARGE MEASUREMENTS OF NORTH BRANCH OF SHEEP RIVER, AT MILLARVILLE, ALTA.,
in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Apr. 26.....	H. R. Carscallen	41	30.8	3.12	2.15	96.0
June 14	R. T. Salmon	97	248.2	1.47	2.79	365.6
July 20.....	L. R. Brecken	59	193.0	0.66	2.15	128.4
Aug. 24	do	72	207.4	0.61	*2.97	126.5
Oct. 8.....	do	41.5	43.8	1.70	*2.79	74.8

* New gauge, datum 1.27 below old gauge datum.

DAILY GAUGE-HEIGHT IN FEET OF NORTH BRANCH OF SHEEP RIVER AT MILLARVILLE, ALTA.,
for 1911.

Day	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1.....		1.73	1.70	3.10	2.70	2.20	2.88	2.86	2.32
2.....		1.60	1.75	3.00	2.79	2.10	2.78	2.86	2.32
3.....		1.60	1.75	2.60	2.60	2.15	2.95	2.95	2.32
4.....		1.60	1.75	2.60	2.50	2.40	3.43	2.90	2.32
5.....		1.60	1.83	2.45	2.40	2.45	3.50	2.84	2.32
6.....		1.60	2.10	2.35	2.40	2.48	3.50	2.80	2.32
7.....		1.60	1.80	2.30	2.32	4.68	3.45	2.78	2.32
8.....		1.60	1.78	2.30	2.19	5.72	3.42	2.76	2.32
9.....		1.75	1.72	2.23	2.10	4.58	3.45	2.74	2.32
10.....		2.72	1.72	2.18	2.10	4.51	3.30	2.74	2.32
11.....		2.25	1.67	2.16	2.10	3.80	3.19	2.73	2.32
12.....		1.75	1.67	2.14	2.10	3.50	3.15	2.72	2.32
13.....		1.54	1.83	2.14	2.00	3.00	3.11	2.72	2.32
14.....		1.54	2.00	2.83	2.00	2.95	3.00	2.69	2.32
15.....		1.50	2.49	2.55	1.98	3.15	2.94	2.67	2.32
16.....		1.83	3.65	2.35	1.84	2.93	2.94	2.67	.....
17.....		1.86	3.29	2.23	1.89	2.63	2.95	2.64	.....
18.....		1.83	2.77	2.23	1.80	2.45	2.85	2.61	.....
19.....		1.73	2.55	2.06	2.10	2.20	2.83	2.55	.....
20.....		1.85	2.45	2.04	2.10	2.04	2.77	2.55	.....
21.....		2.05	2.33	2.04	2.06	1.85	2.77	2.55	.....
22.....		2.30	2.25	2.04	2.00	1.73	2.75	2.55	.....
23.....	1.93	2.30	2.20	2.04	2.00	1.75	2.82	2.55	.....
24.....	1.97	2.15	2.13	2.13	1.84	*2.97	2.83	2.40	.....
25.....	1.70	2.10	2.13	2.25	1.80	2.98	2.85	2.40	.....
26.....	1.47	2.15	2.13	2.20	1.80	3.20	2.92	2.39	.....
27.....	1.47	1.85	2.29	2.15	1.80	3.15	2.93	2.39	.....
28.....	1.47	1.82	2.58	2.15	1.78	3.03	2.93	2.39	.....
29.....	1.60	1.69	2.77	2.40	1.78	2.94	2.87	2.40	.....
30.....	1.73	1.70	3.10	2.86	1.75	2.88	2.87	2.40	.....
31.....	1.73		3.30	.....	1.70	2.88	.....	2.35	.....

* New gauge established, datum 1.27 below old gauge datum.

SOUTH BRANCH OF SHEEP RIVER NEAR BLACK DIAMOND, ALTA.

This station was established May 23, 1908, by P. M. Sauder. It is located at the steel highway bridge on the road allowance between Secs. 8 and 17, Tp. 20, Rge. 2, W. 5th Mer. It is one half mile from Black Diamond P.O.

The gauge, which is of the standard chain type, is fastened to the downstream side of the floor of the bridge, about midway between the west abutment and the centre pier. Bench-mark No. 1 consists of two nail-heads on the north face of the west abutment; elevation, 9.37 above the zero of the gauge. Bench-mark No. 2 is a block of wood nailed to the north face of the centre pier; elevation, 7.67.

The channel is straight for about 150 feet above the station, then swings sharply to the left. It is straight for about 500 feet below the station, then turns gradually to the right. Both banks are composed of gravel. The right bank is low, partly covered with brush, and overflows in higher stages of the stream. The left bank is high and cannot overflow. The bed is composed of coarse gravel; it is permanent in low-water stages of the stream, but a gravel bar at the right bank, which is covered during high-water stages, is liable to shift. The river has considerable fall and the current is swift.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the outer edge of the bed-plate on the west end of the bridge. Distances from the initial point are marked at every five feet, on the bottom chord of the bridge.

During 1911, the gauge was read by Herbert Arnold, merchant at Black Diamond.

DISCHARGE MEASUREMENTS OF SOUTH BRANCH OF SHEEP RIVER NEAR BLACK DIAMOND, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Apr. 25.....	H. R. Carscallen.....	76.1	99.3	1.93	0.95	191.4
May 19.....	R. T. Sailman	77.0	127.2	2.73	1.36	347.0
June 15	do	81.5	184.1	4.00	1.96	735.9
July 20.....	L. R. Brereton	72.0	96.8	2.39	1.06	231.6
Aug. 26.....	do	78.5	138.8	2.20	1.41	305.7
Sept. 29.....	do	78.0	115.3	1.85	1.15	213.2

DAILY GAUGE-HEIGHT AND DISCHARGE OF SOUTH BRANCH OF SHEEP RIVER NEAR BLACK DIAMOND, ALTA., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1...			0 13	29	0 63	100	2 33	1025
2...			0 43	61	0 63	100	2 43	1103
3....			*0 07	20	0 65	104	2 43	1103
4....			0 53	79	0 73	124	1 93	713
5....			0 43	61	0 88	168	1 83	635
6...			0 43	61	1 13	255	1 63	497
7...			0 35	50	0 78	138	1 53	437
8....			0 33	47	0 80	143	1 49	415
9...			0 43	61	0 73	124	1 54	443
10...			0 48	70	0 73	124	1 64	504
11 ...			0 53	79	0 64	102	1 69	536
12...			0 71	119	0 68	111	1 94	721
13....			0 53	79	0 78	138	1 99	760
14....			0 53	79	0 68	111	1 99	760
15...			0 43	61	1 08	237	1 96	737
16....			0 58	89	2 45	1119	1 84	643
17....			0 58	89	1 93	713	1 86	659
18....			0 63	100	1 61	484	1 64	504
19....			0 48	70	1 36	350	1 64	504
20....			0 68	111	1.28	314	1 69	536
21....			0 91	178	1 26	306	1.84	643
22....			1 03	220	1 26	306	1.84	643
23....			0 83	152	1.13	255	1 52	432
24....			0 88	168	1.06	230	1 47	404
25....			0 94	188	0.98	202	1.82	628
26....			0 93	184	0.95	192	1 59	472
27....	0.94	188	0.83	152	0.93	184	1 54	443
28....	0.85	158	0 68	111	1 03	220	†1.51	426
29 ...	0.44	63	0.53	79	1 23	293	1.49	415
30...	0.48	70	0 53	79	1 83	635	1.54	443
31 ..	0.63	100	....	....	2 28	986	...	....

DAILY GAUGE-HEIGHT AND DISCHARGE OF SOUTH BRANCH OF SHEEP RIVER NEAR BLACK DIAMOND, ALTA., for 1911.—Continued.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1 64	504	†1 13	255	1 22	236	1 12	204
2....	1 52	432	1 32	331	1 14	210	†1 12	204
3.....	1 49	415	1 46	399	1 34	280	1 12	204
4.....	1 19	277	†1 57	461	2 74	1217	1 06	186
5.....	1 14	259	1 69	536	†2 76	1233	1 04	181
6....	1 19	277	1 84	643	2 79	1256	1 04	181
7.....	1 19	277	4 04	2360	2 04	671	1 04	181
8.....	1 24	297	3 24	1720	2 04	671	1 04	181
9.....	1 19	277	2 54	1162	2 04	671	1 04	181
10.....	1 14	259	2 44	1076	1 84	526	1 04	181
11.....	1 06	230	2 24	910	1 89	558	1 04	181
12.....	1 04	223	2 14	826	2 19	788	1 04	181
13....	1 01	212	1 94	656	1 74	464	1 04	181
14.....	0 99	206	1 89	610	1 66	419	0 99	166
15.....	0 82	149	1 59	418	1 54	362	0 99	166
16....	†0 94	188	1 62	424	1 46	328	0 99	166
17.....	1 06	230	1 51	366	1 36	287	0 96	158
18.....	1 04	223	1 42	320	1 34	280	0 94	152
19.....	1 04	223	1 34	284	1 26	250	0 92	147
20.....	1 07	234	1 34	280	1 24	243	0 94	152
21.....	1 04	223	1 29	260	1 34	280	0 92	147
22.....	1 06	230	1 26	250	1 34	280	0 89	138
23.....	1 06	230	1 24	243	1 32	272	0 92	147
24.....	1 04	223	1 19	226	1 39	299	0 92	147
25.....	1 04	223	1 14	210	1 29	260	†0 90	141
26.....	1 06	230	1 41	307	1 24	243	0 89	138
27.....	1 04	223	1 34	280	1 22	236	0 84	126
28.....	1 02	216	1 34	280	1 22	236	0 82	121
29.....	0 94	188	1 34	280	1 19	226	0 84	126
30.....	0 94	188	1 29	260	1 14	210	0 84	126
31.....	0 94	188	1 24	243	.....	.....	0 84	126

* Negative gauge height water below zero of the gauge.
† No observation, gauge height interpolated.

MONTHLY DISCHARGE OF SOUTH BRANCH OF SHEEP RIVER NEAR BLACK DIAMOND, Alta., for 1911.
(Drainage area, 241 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
March (27-31).....	188	63	116	0 481	0 09	1,150
April	220	20	975	0 405	0 45	5,802
May.....	1,119	100	286	1 187	1 37	17,585
June.....	1,103	415	606	2 515	2 81	36,060
July.....	504	149	250	1 037	1 20	15,372
August	2,360	210	544	2 257	2 60	33,449
September	1,256	210	450	1 867	2 08	26,777
October	204	121	162	0 672	0 77	9,961
The period .....	.....	.....	.....	.....	11 37	146,156

SHEEP RIVER NEAR OKOTOKS, ALTA.

This station was established by J. F. Hamilton in 1906. It is located at the Canadian Pacific Railway bridge about one mile from Okotoks, on the N. W. $\frac{1}{4}$ Sec. 22, Tp. 20, Rge. 29, W. 4th Mer.
The railway company has replaced the old wooden structure by a two-span steel bridge resting on cement abutments and central pier. In consequence the cross-section has undergone

considerable change since the station was first established. The old wooden piers still remain in the cross-section and these, as well as a number of short piles in the bed of the stream above the section, considerably affect the velocity observations.

The channel is straight for 500 feet above and below the station, the current being swift throughout this course. The right bank is high with a gradual slope; the left bank is comparatively low and will overflow in high stages of the stream. Both banks are covered with brush and large trees. The bed of the stream is composed of sand and coarse gravel and shifts considerably.

The gauge is a plain staff, graduated to feet and tenths, imbedded in the cement of the left face of the centre pier near the downstream end. Owing to a timber, rock-filled cribbing around the pier only high-water observations can be read on this gauge and for low stages an auxiliary gauge, graduated to feet and hundredths, was spiked to the cribwork opposite the permanent gauge on the left side of the pier.

The gauges are referred to a bench-mark on the top of the left abutment at its southwest corner. This is a Canadian Pacific Railway bench-mark and the elevation marked upon it, 3431.57, is used for reference. The elevation of the gauge datum for the permanent gauge imbedded in the pier is 3420.12 feet and that of the gauge datum for the auxiliary gauge on the cribwork of the pier is 3418.12 feet.

During 1911, the gauge was read by Miss May Henderson.

DISCHARGE MEASUREMENTS OF SHEEP RIVER NEAR OKOTOKS, ALTA., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Apr. 21.....	H. C. Ritchie.....	99.0	198.9	2.20	3.24	438.2
May 20.....	R. T. Sailman.....	98.0	258.2	2.25	3.48	581.6
June 15.....	do.....	98.5	337.3	3.01	4.02	1,016.7
July 25.....	L. R. Brereton.....	146.0	165.8	1.61	3.00	267.2
Aug. 28.....	do.....	98.0	418.8	1.17	2.76	489.7
Sept. 30.....	do.....	98.0	385.8	0.91	2.55	352.2

DAILY GAUGE-HEIGHT AND DISCHARGE OF SHEEP RIVER, NEAR OKOTOKS, ALTA., for 1911.

DAY.	April		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.40	110	2 70	182	4 90	1720	4 10	1080
2.....	2.30	92	2 70	182	4 70	1560	4 00	1000
3.....	2.10	66	2 70	182	4 70	1560	†3 80	840
4.....	2.30	92	2 70	182	4 30	1240	3 60	680
5.....	2.30	92	3 00	294	3 90	920	3 50	600
6.....	2.30	92	3 30	484	3 70	760	3 40	520
7.....	2.30	92	3 10	348	3 60	680	3 40	520
8.....	2.50	130	2 90	250	3 50	600	3 40	520
9.....	2.50	130	2 90	250	3 60	680	3 40	520
10.....	3.30	484	3 00	294	3 60	680	3 20	372
11.....	3.70	804	2 90	250	3 70	760	3 20	372
12.....	3.00	294	†2 95	272	4 00	1000	3 00	268
13.....	2.90	250	3 00	294	†4 15	1120	3 00	268
14.....	2.70	182	3 10	318	4 30	1240	3 00	268
15.....	2.70	182	3 50	632	4 00	1000	3 00	268
16.....	2.70	182	4 20	1186	3 80	840	2 80	194
17.....	3.00	294	4 70	1580	3 70	760	2 90	226
18.....	†3 00	294	4 50	1408	3 60	680	2 90	226
19.....	3.00	294	3 70	764	3 60	680	2 90	226
20.....	3.00	294	3 50	600	3.50	600	3 10	316
21.....	3.10	348	3 40	520	3 40	520	3 00	268
22.....	3.50	644	3 40	520	3 30	440	3 00	268
23.....	3.30	484	3 40	520	3 40	520	3 00	268
24.....	3.20	408	3 20	372	3 40	520	3 00	268
25.....	3.30	484	3 10	316	4.00	1000	†3 00	268
26.....	3.20	408	3 10	316	3 50	600	3 00	268
27.....	3.00	294	3 30	440	3 70	760	2 90	226
28.....	3.00	294	3 50	600	3 70	760	2 90	226
29.....	2 80	214	3 80	840	3 50	600	2 90	226
30.....	2.60	154	4 40	1320	†3 80	840	2 80	194
31.....			4 90	1720			2 80	194

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE OF SHEEP RIVER, NEAR OKOTOKS, ALTA.,
for 1911.—*Continued.*

DAY.	August.		September.		October.		November.	
	Gauge Height	Dis- charge.	Gauge Height	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height	Dis- charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	2.90	226	2.60	380	†2.53	341	2.30	232
2.	3.20	372	†3.16	814	2.52	335	2.30	232
3.	3.50	600	†3.73	1270	2.59	374	2.30	232
4.	3.80	840	4.30	1726	2.58	369	†2.29	229
5.	3.90	920	3.75	1286	2.56	358	2.28	225
6.	3.90	920	3.58	1150	2.50	324		
7.	5.52	2310	3.40	1006	2.50	324		
8.	5.74	2410	3.40	1006	2.48	314		
9.	4.90	1970	3.35	966	†2.46	304		
10.	4.20	1180	†3.30	926	2.45	299		
11.	4.00	1404	3.25	886	2.43	289		
12.	3.70	1246	3.25	886	2.35	253		
13.	3.50	1086	3.24	878	†2.35	253		
14.	3.20	846	†3.12	782	2.35	253		
15.	3.10	766	†3.00	686	2.32	240		
16.	3.30	926	2.87	582	2.30	232		
17.	3.20	846	2.76	494	2.30	232		
18.	2.80	526	†2.68	433	†2.29	229		
19.	2.80	526	2.60	389	2.28	225		
20.	2.90	606	2.58	360	2.28	225		
21.	2.90	606	2.60	380	2.27	222		
22.	2.80	526	†2.60	380	†2.28	225		
23.	†2.80	526	2.60	380	2.29	229		
24.	2.80	526	2.57	363	2.30	232		
25.	2.70	446	2.58	369	2.30	232		
26.	2.90	606	2.60	380	†2.50	324		
27.	2.90	606	2.60	380	2.70	446		
28.	2.76	494	2.60	380	†2.50	324		
29.	†2.71	454	2.58	369	2.30	232		
30.	2.66	420	2.55	352	†2.30	232		
31.	2.65	413			2.30	232		

† No observation, gauge-height interpolated.

MONTHLY DISCHARGE OF SHEEP RIVER NEAR OKOTOKS, ALTA., for 1911.

(Drainage area, 624 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April.....	804	66	273	0.438	0.49	16,245
May.....	1,720	182	563	0.902	1.04	34,618
June.....	1,720	440	855	1.370	1.53	50,876
July.....	1,080	194	386	0.619	0.71	23,734
August.....	2,410	226	853	1.367	1.58	52,449
September.....	1,726	352	688	1.103	1.23	40,939
October.....	446	222	281	0.450	0.52	17,278
November (1-5).....	232	225	230	0.369	0.07	2,281
The period					7.17	238,420

PEKISKO CREEK AT PEKISKO, ALTA.

This station was established October 6, 1911, by L. R. Brereton. It is located on the N.W, 14 Sec. 8, Tp. 17, Rge. 2, W. 5th Mer., about 200 yards from Mr. Geo. Lane's ranche house and is about twenty-five miles southwest of High River.

Discharge measurements are made from a small suspension foot-bridge at high stages and at a wading section near the station in low water. The initial point for soundings is the stream side of the large tree on the left bank to which the end of the bridge is attached.

The channel is straight for 200 feet above and 150 feet below the station. Both banks are fairly low, sparsely covered with brush and trees, and liable to overflow in high stages of the stream. The bed is composed of fine gravel.

The gauge is a plain staff, graduated to feet and hundredths, spiked to a post driven into the bed of the stream at the right bank about ten feet downstream from the bridge. The zero (elev., 93.90) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated on the left bank 125 feet N. 55° E. from the gauge.

The gauge was read once daily by F. R. Pike, Mr. Lane's ranche foreman.

As the station was established very late in the season the data obtained was insufficient to compute daily discharges.

DISCHARGE MEASUREMENTS of Pekisko Creek at Pekisko, Alta., in 1911

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Aug. 31.....	L. R. Brereton	42.9	43.4	0.81		35.2
Oct 6.....	do	44.6	41.6	1.19	1.46	49.5

DAILY GAUGE-HEIGHT in feet of Pekisko Creek, near Pekisko, Alta., for 1911.

	October.	November.
1.....		1.25
2.....		1.25
3.....		1.25
4.....		1.25
5.....		1.24
6.....	1.46	1.20
7.....	1.46	1.20
8.....	1.46	
9.....	1.45	
10.....	1.44	
11.....	1.43	
12.....	1.43	
13.....	1.41	
14.....	1.35	
15.....	1.35	
16.....	1.35	
17.....	1.34	
18.....	1.34	
19.....	1.32	
20.....	1.31	
21.....	1.31	
22.....	1.31	
23.....	1.31	
24.....	1.30	
25.....	1.30	
26.....	1.25	
27.....	1.25	
28.....	1.25	
29.....	1.25	
30.....	1.25	
31.....	1.25	

STIMSON CREEK NEAR PEKISKO, ALTA.

This station was established October 6, 1911, by L. R. Brereton. It is located on the S.E. 1/4 Sec. 14, Tp. 17, Rge. 2, W. 5th Mer., at the traffic bridge on the surveyed trail running south-west from High River.

Discharge measurements are made from the downstream side of the bridge and in low stages a wading section near the station is used. The initial point for soundings is the east side of the first pile at the left abutment.

SESSIONAL PAPER No. 25d

The channel is straight for 300 feet above and 200 feet below the station. The current is swift and at low stages the water surface is rough at the station and a short distance above, owing to the presence of rapids. The right bank is high and clear of brush; the left bank is high with a gradual slope and is partly covered by a sparse growth of willows. The bed is composed of coarse gravel.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to the upstream side of the first pile bent from the right abutment. The zero (elev., 92.54) is referred to a permanent iron bench-mark (assumed elev., 100.00 feet) situated on the right bank a few feet upstream from the end of the bridge.

The gauge was read once daily by J. F. Mitchell, a farmer living within 300 yards of the bridge.

DISCHARGE MEASUREMENTS of Stimson Creek, near Pekisko, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Aug. 31.....	L. R. Brereton	27	26.6	0.49	1.19	13.0
Oct. 6.....	do	28.5	32.5	0.84		27.2

DAILY GAUGE-HEIGHT AND DISCHARGE of Stimson Creek, near Pekisko, Alta. for 1911.

DAY.	October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.06	24
2.....			1.05	24
3.....			1.05	24
4.....			1.05	24
5.....			1.00	22
6.....	1.19	28	1.00	22
7.....	1.18	27	1.00	22
8.....	1.16	27	1.00	22
9.....	1.10	25	1.00	22
10.....	1.05	24	1.00	22
11.....	1.02	23	1.00	22
12.....	1.01	22	1.00	22
13.....	1.06	24	1.00	22
14.....	1.05	24	1.00	22
15.....	1.04	23	1.00	22
16.....	1.03	23		
17.....	1.05	24		
18.....	1.04	23		
19.....	1.04	23		
20.....	1.01	22		
21.....	1.04	23		
22.....	1.06	24		
23.....	1.06	24		
24.....	1.07	24		
25.....	1.05	24		
26.....	1.00	22		
27.....	1.05	24		
28.....	1.06	24		
29.....	1.08	24		
30.....	1.07	24		
31.....	1.07	24		

MONTHLY DISCHARGE of Stimson Creek, near Pekisko, Alta., for 1911.

(Drainage area 82 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.
October(6-31).....	28	22	24.9	0.304	0.28	1,235
November 1-12.....	24	22	22.5	0.274	0.15	660
The period.....					0.43	1,904

FINDLAY AND McDOUGAL DITCH NEAR HIGH RIVER, ALTA.

This station was established on June 17, 1911, by J. C. Milligan. It is located on the S.W. ¼ Sec. 31, Tp. 18, Rge. 29, W. 4th Mer., and is about four and one half miles west of High River.

The gauge, which is a plain staff graduated to feet and inches, is nailed to a post driven into the bed of the ditch, near the left bank. The zero of the gauge (elev., 99.25) is referred to the top of a stake (assumed elev., 100.00) on the right bank, and 50 feet southeast of the gauge.

The channel is straight for 150 feet above and 175 feet below the gauge. The right bank is built up from the excavation of the ditch and is low. The left is clean, high and gravelly. The bed is composed of clay and is not liable to shift.

Discharge measurements are made with a meter by wading. The initial point for soundings is a stake on the right bank.

The gauge is read by H. Robertson.

DISCHARGE MEASUREMENTS of Findlay and McDougal Ditch, near High River, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 24.....	L R Breiten	6.60	5.40	0.91	1.25	4.89
Aug. 30.....	do.....	5.20	1.67	0.42	0.75	0.70
Oct. 5.....	do.....	6.80	4.36	0.65	1.10	2.83

LITTLE BOW DITCH AT HIGH RIVER, ALTA.

This canal, about 2000 feet in length, was built by the Alberta Government to divert water from Highwood river into Little Bow river. This latter stream has a small flow and in dry seasons does not supply sufficient water for domestic and stock watering purposes. Shortly after its construction, the diverting dam was damaged, and the ditch was not used until summer of 1910, when the dam was repaired. The gauging station near High River, on the Highwood river, is below the intake to the ditch, so the discharge of the latter has been added to that obtained for the former to get the total discharge of the main stream.

This gauging station, located on Sec. 6, Tp. 19, Rge. 28, W. 4th Mer., at a traffic bridge, and 100 feet from the power-house of the town of High River, was established August 1, 1910, by J. C. Keith.

The gauge is a plain staff, graduated to feet and hundredths, spiked to the cribbing on the left bank. The zero (elev., 91.06) is referred to a bench-mark (assumed elev., 100.00) on the right bank about 60 feet upstream from the gauge.

The channel is straight for several hundred feet above and below the station. Both banks are high, clean and steep, cribbed for twenty feet above and below the bridge, and will not overflow.

Discharge measurements are made from the bridge. The initial point for soundings is on line with the cribbing on the left bank.

The gauge was read daily by Mr. Phillip Weinard.

SESSIONAL PAPER No. 25d

DISCHARGE MEASUREMENTS of Little Bow Ditch at High River, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 25	R. T. Sailman.....	11.3	24.4	1.35	2.58	33.0
July 22	L. R. Brereton.....	8.2	4.07	1.55	1.42	6.30
Aug. 29	do	9.4	4.72	1.72	1.50	8.13
Oct. 4	do	9.0	4.49	1.52	1.46	6.81

DAILY GAUGE-HEIGHT AND DISCHARGE of Little Bow Ditch at High River, Alta., for 1911.

Day.	March.		April		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			1.69	9 7	2 40	26 2	3 50	74.4
2			1.52	7 6	2 44	27 6	3 65	83.0
3			1.57	8 0	3 24	60 8	3 84	94.7
4			1.60	8 4	2 50	29 8	3 25	61.3
5			1.60	8 4	2 60	33 4	2 96	47.7
6			1.66	9 2	2 75	39 1	2 85	43.0
7			1.59	8 3	2 65	35 3	2 46	28.4
8			1.59	8 3	2 60	33 4	2 15	18.7
9			1.86	12 4	2 62	34 2	3 72	0.0*
10			1.88	12 7	2 60	33 4	2 45	0.0*
11			1.89	12 9	2 50	29 8	2 86	0.0*
12			1.80	11 3	2 50	29 8	3 25	0.0*
13			1.87	12 6	2 60	33 4	3 65	0.0*
14			1.79	11 1	2 55	31 6	2 80	41.0
15			1.80	11 3	2 55	31 6	2 80	41.0
16			1.96	14 3	3 85	95 3	2 70	37.2
17			1.98	14 8	3 25	61 3	2 60	33.4
18			2.23	20 8	2 90	45 1	2 55	31.6
19			2.13	18 2	2 75	39 1	2 24	21.1
20			2.30	22 9	2 68	36 4	2 19	19.7
21			2.75	39 1	2 66	35 7	2 08	17.0
22			3.05	51 7	2 69	36 8	2 11	17.7
23			3.12	55 0	2 67	36 1	2 17	19.2
24			2.53	30 9	2 60	33 4	2 10	17.5
25			2.60	33 4	2 58	32 7	2 20	20.0
26	2.15	18.7	2.62	34 2	2 56	32 0	2 03	15.9
27	2.12	18.0	2.63	34 5	2 54	31 2	1 98	14.8
28	2.30	22.9	2.57	32 3	2 55	31 6	2 08	17.0
29	2.04	16.1	2.52	30 5	2 63	34 5	1 95	14.1
30	1.93	13.7	2.41	26 6	2 80	41 0	2 03	15.9
31	1.87	12.6			3 02	50 4		

DAILY GAUGE-HEIGHT AND DISCHARGE of Little Bow Ditch at High River, Alta., for 1911.—*Con.*

DAY.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis. charge.	Gauge Height	Dis-charge	Gauge Height	Dis-charge.	Gauge Height	Dis-charge	Gauge Height	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2 15	18 7	1 40	6 2	1 45	6 7	1 49	7.1	1 55	7.8
2	2 07	16 8	1 41	6 3	1 44	6 6	1 48	7.0	1 50	7.2
3	2 02	15 6	1 45	6 7	1 47	6 9	1.47	6.9	1 50	7.2
4	2 10	17 5	1 45	6 7	2 28	22 3	1 49	7.1	1 50	7.2
5	2 15	18 7	1 51	7 3	2 20	20 0	1.50	7.2	1.55	7.8
6	2 06	16 5	1 54	7 7	2 02	15 6	1 50	7.2	1 53	7.6
7	2 05	16 3	1 74	10 4	1 97	14 5	1.46	6.8	1 70	9.8
8	1 95	14 1	2 46	28 4	1 95	14 1	1.46	6 8	1 64	9 0
9	1 83	11 8	2 15	18 7	1 82	11 7	1 45	6.7	1 55	7.8
10	1 44	6 6	1.95	14 1	1 80	11 3	6.9	6.9	1.70	9.8
11	1 63	8 8	1 86	12 4	1 70	9 8	1 47	6.9	1.70	9.8
12	1 53	7 6	1.85	12 2	1 68	9 5	1 44	6.6	1 90	13.1
13	1 54	7 7	1 70	9 8	1 65	9 1	1 40	6.2	2 05	16.3
14	1 63	8 8	1 66	9 2	1 62	8 7	1 40	6.2	2 02	15.6
15	1 50	7 2	1 63	8 8	1 58	8 2	1 38	6.0	2 01	15.4
16	1 62	8 7	1 67	9 4	1.55	7 8	1 38	6.0		
17	1.58	8 2	1 64	9 0	1.55	7 8	1 37	5 9		
18	1 60	8 4	1 55	7 8	1 54	7 7	1 37	5 9		
19	1 60	8 4	1 50	7 2	1 55	7 8	1 35	5 7		
20	1.60	8 4	1.49	7 1	1 54	7 7	1 35	5.7		
21	1 43	6 5	1 47	6 9	1 53	7 6	1 35	5.7		
22	1 42	6 4	1 43	6 5	1 55	7 8	1 35	5.7		
23	1.45	6 7	1 43	6 5	1 53	7 6	1 35	5.7		
24	1 43	6 5	1 44	6 6	1 52	7 4	1.35	5.7		
25	1 41	6 3	1 60	8 4	1 51	7 3	1.34	5.6		
26	1 36	5 8	1 64	9 0	1 52	7 4	1 50	7.2		
27	1.42	6 4	1 56	7 9	1 52	7 4	1 55	7.8		
28	1 41	6 3	1 60	8 4	1 50	7 2	1 64	9.0		
29	1 38	6 0	1 52	7 4	1 50	7 2	1 44	6.6		
30	1 36	5 8	1 47	6 9	1 49	7 1	1 37	5.9		
31	1 37	5 9	1 45	6 7			1 35	5.7		

* Headgates closed for repairs. No flow in ditch.

MONTHLY DISCHARGE of Little Bow Ditch at High River, Alta., for 1911.

MONTH	DISCHARGE IN SECOND-FEET.			Total Discharge in acre-feet.
	Maximum.	Minimum	Mean.	
March (26-31)	22.9	12.6	17.0	202
April	55.0	7.6	20.4	1,214
May	95.3	26.2	38.1	2,343
June	94.7	0.0	28.2	1,678
July	18.7	5.8	9.8	603
August	28.4	6.2	9.2	566
September	22.3	6.6	9.6	571
October	9.0	5.6	6.5	400
November (1-15)	16.3	7.2	10.1	300
The period				7,877

HIGHWOOD RIVER AT HIGH RIVER, ALTA.

This station was first established some years ago, by the Irrigation Surveys. It was re-established May 28, 1908, by P. M. Sauder. It is located at the highway bridge in the town of High River, on the N.W. ¼ Sec. 6, Tp. 19, Rg. 28 W. 4th Mer.

A plain staff gauge, graduated to feet and tenths, is fastened vertically to the downstream face of the centre pier. It is referred to bench-marks as follows: (1) top of crib pier to which the gauge height is fixed, elevation 10.41; (2) top of crib abutment on the left bank, elevation 10.40; (3) southwest corner of concrete pier supporting north end of C. P. R. bridge, elevation 8.38.

The channel is straight for about 300 feet above and below the station. The right bank is low and liable to overflow. It is composed of gravel and sand and covered with brush. The left bank is low, but is protected from overflow by a crib work. The current is swift in high stages of the stream, but is sluggish in low water.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the inside edge of the crib abutment, supporting the north end of the bridge. Distances are marked on the bottom chord of the bridge at every five feet from the initial point. There is an eddy about the centre pier and special care must be exercised by the hydrographer in making discharge measurements at this station. At extreme low water, a check measurement is made at a wading station about 300 yards below the bridge.

Little Bow Ditch diverts water from Highwood River at a point about half a mile above this station. For some time previous to 1910, the diverting dam was out of repair and water could only be diverted during high-water periods. In the summer of 1910 this dam was repaired and water has since been diverted. A gauge was established on the canal and records of the flow are given above.

During a flood in 1908, Highwood River overflowed its left bank some distance above the traffic bridge and did considerable damage to property. To prevent a repetition of this occurrence, a highwater overflow channel has been constructed from the Lineham mill pond to the river. The water carried off through this spillway does not pass the gauging station. During 1911, there was no flood and there was only an occasional flow through the spillway when the company raised the water in the pond to float logs.

Miscellaneous discharge measurements of this flow were made on the same day that Highwood River was measured. The flow through the Little Bow Ditch and Lineham's Spillway have both been added to the flow at the traffic bridge to obtain the total monthly flow in Highwood River.

Daily observations of the gauge at the regular station on Highwood River were made by W. E. M. Holmes during 1911.

DISCHARGE MEASUREMENTS of Highwood River at High River, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Apr. 22.....	H. C. Ritchie.....	91	381.3	0.79	2.61	302.9
June 17.....	R. T. Sailman.....	152	491.3	3.99	3.95	1962.0
July 21.....	L. R. Brereton.....	123	296.9	1.62	2.86	480.3
Aug. 29.....	do	130	293.8	1.85	2.85	544.8
Oct. 4.....	do	131	293.6	1.84	2.87	540.2

DAILY GAUGE-HEIGHT AND DISCHARGE of Highwood River at High River, Alta., for 1911

DAY.	March.		April.		May.		June.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge	Height.	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2.00	60	2.54	264	4.30	2620
2			2.00	60	2.57	282	4.34	2696
3			2.00	60	2.65	330	4.62	3250
4			2.00	60	2.70	360	4.15	2335
5			2.00	60	2.78	416	4.00	2050
6.			2.00	60	3.00	600	3.85	1770
7.			2.00	60	2.99	591	3.75	1595
8.			2.00	60	2.87	486	3.69	1494
9.			2.10	85	2.83	454	3.67	1462
10.			2.16	103	2.82	446	3.87	1806
11.			2.20	115	2.75	395	3.97	1993
12.			2.15	100	2.70	360	4.05	2145
13.			2.00	60	2.75	395	4.14	2316
14.			1.88	42	2.80	430	4.33	2677
15.			1.87	40	2.85	470	4.25	2525
16.			2.06	75	3.84	1752	4.00	2050
17.			2.18	109	4.10	2240	3.92	1898
18.			2.07	78	3.72	1544	3.92	1898
19.			2.15	100	3.44	1116	3.78	1646
20.			2.25	133	3.23	846	3.66	1446
21.			2.37	178	3.25	870	3.65	1430
22.	2.10	85	2.60	300	3.24	858	3.60	1350
23.	2.15	100	2.67	342	3.21	822	3.67	1462
24.	2.25	133	2.72	374	3.13	733	3.59	1335
25.	2.20	115	2.75	395	3.10	700	3.59	1335
26.	2.10	85	2.80	430	3.04	640	3.55	1275
27.	2.00	60	2.72	374	3.00	600	3.47	1158
28.	2.11	88	2.72	374	3.04	640	3.51	1215
29.	2.07	78	2.57	282	3.13	733	3.90	1116
30.	2.05	72	2.60	300	3.44	1116	3.45	1130
31.	2.00	60			3.88	1824		

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Highwood River at High River, Alta., for 1911 —*Con.*

DAY.	July.		August.		September		October.		November.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge	Height.	charge.	Height.	charge.	Height	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3 58	1320	2 61	306	2 70	425	2 90	570	2 55	338
2	3 41	1074	2 67	342	2 69	419	2 90	570	2 62	377
3	3 34	982	2 85	470	3 12	770	2 92	587	2 50	310
4	3 31	943	3 13	733	3 76	1619	2 87	547	2 46	290
5	3 27	894	3 05	650	3 95	1955	2 83	517	2 41	265
6	3 17	777	3 11	720	3 84	1755	2 79	488	2 50	215
7	3 15	755	3 40	1070	3 80	1685	2 77	474	2 10	145
8	3 13	733	4 33	2700	3 74	1586	2 75	460	1 80	60
9	3 15	755	4 06	2180	3 65	1445	2 74	453	1 80	60
10	3 15	755	3 83	1760	3 60	1370	2 73	446	1 80	60
11	3 10	700	3 64	1450	3 55	1297	2 71	432	1 80	60
12	3 07	670	3 53	1280	3 50	1225	2 70	425	1 80	60
13	3 02	620	3 36	1040	3 45	1158	2 70	425	1 80	60
14	2 89	502	3 26	910	3 38	1065	2 68	413	*2 30	
15	2 92	528	3 18	830	3 27	930	2 67	407	2 50	
16	2 86	478	3 30	980	3 23	884	2 66	401		
17	2 87	486	3 15	800	3 19	840	2 63	383		
18	2 92	528	3 05	703	3 15	800	2 61	371		
19	2 91	519	3 00	635	3 13	780	2 50	310		
20	2 89	502	2 98	638	3 11	760	2 51	316		
21	2 88	494	2 95	612	3 08	731	2 53	326		
22	2 86	478	2 93	596	3 05	703	2 53	326		
23	2 83	454	2 90	570	3 00	655	2 53	326		
24	2 75	395	2 85	533	2 98	638	2 59	360		
25	2 72	374	2 80	495	2 98	638	2 53	326		
26	2 74	388	3 03	683	2 96	621	2 50	310		
27	2 71	367	2 98	638	2 99	646	2 50	310		
28	2 69	354	2 89	563	2 99	646	2 50	310		
29	2 62	312	2 85	533	2 95	612	2 50	310		
30	2 55	270	2 77	474	2 90	570	2 52	321		
31	2 55	270	2 74	453			2 53	326		

* River freezing over.

MONTHLY DISCHARGE of Highwood River at High River, Alta., for 1911.

Drainage area, 756 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
March (22-31)	150	72.6	105	0.139	0.05	2,083
April	464	51.3	182	0.241	0.27	10,830
May	2,301	290	790	1.045	1.20	48,575
June	3,345	1,130	1,844	2.439	2.72	109,726
July	1,339	276	612	0.810	0.93	37,630
August	2,728	312	860	1.138	1.31	52,879
September	1,975	426	984	1.302	1.45	58,552
October	594	316	412	0.545	0.63	25,333
November (1-13)	384	67.8	186	0.246	0.12	4,796
The period					8.68	350,404

NOTE.—The flow through Little Bow Ditch and Lineham's Spillway have been added to the flow at the traffic bridge to obtain the total monthly flow of Highwood River.

HIGHWOOD RIVER NEAR ALDERSYDE, ALTA.

This station was established October 3, 1911, by L. R. Brereton. It is located at the traffic bridge on the surveyed trail about one mile east of Aldersyde, in the N.W. ¼ Sec. 17, Tp. 20, Rge. 28, W. 4th Mer.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the stream face of the north, or left abutment.

The channel is straight for 1000 feet above and 150 feet below the station. Both banks are high, clear of brush and not liable to overflow. The bed is of coarse gravel with a scattering of large stones and boulders in and near the section. The latter affect the velocity observations to some extent. The current is swift.

The gauge which is a plain staff graduated to feet and hundredths is nailed near the up-stream end of the left, or north face of the centre pier. The zero (elev., 90.64) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated on the left bank, near the north end of the bridge.

The gauge was read once daily by L. W. Barrett, a farmer living within 100 yards of the bridge; but as only one discharge measurement was made after the gauge was installed, daily discharges could not be computed.

DISCHARGE MEASUREMENTS of Highwood River near Aldersyde, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 25	R. T. Sailman.....	160	282.4	2.63	...	742.2
June 16	do	214	519.2	4.13	...	2146.0
July 24.....	L. R. Brereton	144	236.3	2.06	...	486.7
Aug. 28.....	do	159	269.5	2.10	...	548.5
Oct. 3.....	do	159	268.0	2.20	1.84	589.3

DAILY GAUGE-HEIGHT IN FEET of Highwood River near Aldersyde, Alta., for 1911.

DAY.	October.	November.
1		1 35
2		1 60
3	1.85	1 60
4	1.80	1 55
5	1.80	1 40
6	1.73	1 30
7		1 30
8	1.70	1 35
9	1.68	1 00
10	1.68	0 95
11	1.65	0 95
12	1.62	1 35
13	1.62	1 30
14	1.60	1 35
15	1.60	1 40
16.....	1.58	.....
17.....	1.55	.....
18.....	1.50	.....
19.....	1.48	.....
20.....	1.48	.....
21.....	1.50	.....
22.....	1.45	.....
23.....	1.48	.....
24.....	1.48	.....
25.....	1.48	.....
26.....	1.45	.....
27.....	1.20	.....
28.....	1.32	.....
29.....	0.95	.....
30.....	1.60	.....
31.....	1.60	.....

NOTE.—Gauge-heights after Oct. 27 are affected by ice.

SESSIONAL PAPER No. 25d

BOW RIVER NEAR BASSANO, ALTA.

This station was established August 20, 1909, by the irrigation department of the Canadian Pacific Railway Company. It is located at the Horseshoe bend in Bow River, near the east boundary of the Blackfoot Indian reserve, and is about three miles southwest of Bassano, and one mile upstream from the site of the Canadian Pacific Railway Company's dam.

The stream flows in one channel at all stages. It gently curves for 600 feet above and 2000 feet below the station. The right bank is high, steep and sparsely covered with brush, and is composed of gravel. The left bank is high, composed of clay, and covered with brush near water's edge. The bed of the stream is composed of gravel, and during low water and ordinary stages of the stream there is a wide gravel beach at the left bank. The current has a moderate velocity.

Discharge measurements are made by means of a cable and car. The initial point for soundings is a stake on the left bank, and distances are marked at every twenty feet on the cable by white paint.

The gauge, which is a plain staff graduated to feet and tenths, is situated in the bed of the stream near the left bank. The zero is referred to the datum of the irrigation department of the Canadian Pacific Railway.

Copies of the records of the gauge-height observations and gaugings made by F. G. Cross during 1911, were given to us by A. S. Dawson, Chief Engineer of the Natural Resources Department of the Canadian Pacific Railway Company.

DISCHARGE MEASUREMENTS of Bow River near Bassano, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Apr. 19	H. C. Ritchie	332	2,192	1.12		2,463
May 3	F. G. Cross		1,612	1.00	2,519.86	1,620
May 5	H. R. Carscallen	330	2,173	0.99	2,520.01	2,153
May 9	F. G. Cross		2,398	1.35	2,520.81	3,224
May 18	do		3,273	2.33	2,522.83	7,638
May 19	H. C. Ritchie	390	2,984	2.14	2,522.26	6,392
May 20	F. G. Cross		2,969	2.00	2,522.06	5,928
June 2	do		3,368	2.52	2,523.71	8,837
June 3	H. R. Carscallen	402.5	3,609	3.29	2,523.97	11,882
June 14	F. G. Cross		4,331	3.82	2,525.10	16,561
June 30	H. R. Carscallen	405	4,097	3.79	2,524.90	15,535
July 6	F. G. Cross		3,900	2.82	2,524.40	11,402
July 15	do		3,309	2.48	2,523.05	8,190
July 27	H. R. Carscallen	395	3,396	2.65	2,523.15	8,993
Aug. 9	F. G. Cross		5,065	4.52	2,526.53	22,878
Aug. 29	do		3,143	2.04	2,522.52	6,431
Sept. 7	do		3,522	2.63	2,523.40	9,265
Sept. 10	J. C. Keith	390	3,248	2.35	2,522.75	7,643
Sept. 27	F. G. Cross		2,570	1.59	2,521.15	4,096
Nov. 3	do		2,156	1.06	2,519.90	2,282

DAILY GAUGE-HEIGHT AND DISCHARGE of Bow River near Bassano, Alta., for 1911.

DAY.	May.		June.		July.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	19.90	2,000	22 83	7,950	25 10	16,400
2	19.90	2,000	23 58	10,428	25 35	17,500
3	19.82	1,920	23 58	11,904	25 15	16,620
4	19.91	2,014	24 09	14,680	24 05	15,750
5	20.01	2,154	24 04	14,480	24 75	14,920
6	20.18	2,302	24 24	12,802	24 42	13,000
7	†20.49	2,864	23 84	11,572	24 03	12,094
8	20.80	3,360	23 52	10,212	23 85	11,410
9	20.81	3,378	23 42	9,852	24 03	12,004
10	20.62	3,072	23 27	9,544	23 95	11,790
11	20.62	3,072	23 23	9,246	23 70	10,860
12	20.58	3,008	23 34	9,576	23 45	9,960
13	20.76	2,976	24 10	12,500	23 27	9,344
14	20.71	3,216	25 40	17,720	23 17	9,024
15	20.91	3,558	25 77	19,362	23 05	8,640
16	20.98	3,684	25 75	19,270	23 00	8,480
17	21.82	5,328	25 72	19,132	23 25	9,280
18	22 83	7,950	25 45	17,940	23 33	9,542
19	22.41	6,766	25 35	17,500	23 37	9,678
20	22.05	5,880	25 23	16,972	23 45	9,960
21	21.76	5,102	25 00	15,960	23 35	9,610
22	21.68	5,016	24 77	15,000	23 20	9,120
23	21.78	5,236	24 70	14,720	23 22	9,164
24	21.88	5,472	25 20	16,840	23 30	9,440
25	21.71	5,082	25 54	18,336	23 25	9,280
26	21.58	4,800	25 95	20,190	23 10	8,800
27	21.61	4,862	25 68	18,952	23 20	9,120
28	21.51	4,660	25 20	16,840	23 25	9,280
29	21.51	4,660	24 90	15,540	22 05	8,320
30	21.51	4,660	24 90	15,540	23 03	8,576
31	21.96	5,664			22 90	8,160

DAILY GAUGE-HEIGHT AND DISCHARGE of Bow River near Bassano, Alta., for 1911.—Continued.

DAY.	August.		September.		October.		November.	
	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge	Gauge Height	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	22.93	8,256	22.34	6,584	21.25	4,170	20.05	2,210
2.	22.90	8,160	22.32	6,532	21.25	4,170	19.95	2,070
3.	22.83	7,950	23.36	9,644	21.10	3,900	19.95	2,070
4.	23.07	8,704	22.40	6,740	21.25	4,170	20.30	2,560
5.	23.27	9,344	22.46	6,896	21.15	3,990	20.40	2,720
6.	23.45	9,960	23.70	10,860	21.15	3,990	20.18	2,392
7.	23.53	10,248	23.10	9,780	21.05	3,810	†	
8.	25.00	15,960	23.10	8,800	21.05	3,810		
9.	26.50	22,780	23.05	8,640	21.00	3,720		
10.	25.75	19,270	22.85	8,010	20.95	3,630		
11.	25.10	16,400	22.75	7,710	20.85	3,450		
12.	24.60	14,320	22.65	7,420	20.80	3,360		
13.	24.20	12,740	22.50	7,000	20.85	3,450		
14.	23.55	10,320	22.35	6,610	20.80	3,360		
15.	23.40	9,780	22.15	6,120	20.75	3,280		
16.	23.35	9,610	22.05	5,880	20.75	3,280		
17.	23.43	9,888	22.00	5,760	20.80	3,360		
18.	23.20	9,120	22.05	5,880	20.70	3,200		
19.	22.89	8,130	21.90	5,520	20.65	3,120		
20.	22.80	7,860	21.72	5,104	20.55	2,960		
21.	22.70	7,560	21.65	4,950	20.60	3,040		
22.	22.55	7,140	21.55	4,740	20.55	2,960		
23.	22.30	6,480	21.60	4,840	20.45	2,800		
24.	22.20	6,240	21.65	4,950	20.45	2,800		
25.	22.05	5,880	21.45	4,540	20.45	2,800		
26.	21.90	5,520	21.35	4,350	20.40	2,720		
27.	21.85	5,400	21.20	4,080	20.25	2,490		
28.	21.70	5,060	21.25	4,170	20.25	2,490		
29.	22.07	5,928	21.40	4,440	20.25	2,490		
30.	22.17	6,168	21.35	4,350	20.25	2,490		
31.	22.25	6,360			20.20	2,420		

† No observation, gauge height interpolated. ‡ Gauge frozen, observations discontinued.
NOTE.—All gauge-heights have been converted into elevation above mean sea level, using C. P. R. I. D. datum, but for convenience in printing the table 2,500 feet has been deducted from each.

MONTHLY DISCHARGE of Bow River near Bassano, Alta., for 1911.

(Drainage area, 8000 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
May	7,950	1,920	4,061	0.508	0.59	249,701
June	20,190	7,950	14,669	1.834	2.05	872,866
July	17,500	8,160	10,833	1.354	1.56	666,095
August	22,780	5,060	9,566	1.196	1.38	588,190
September	10,860	4,080	6,363	0.795	0.89	378,625
October	4,170	2,420	3,286	0.411	0.47	202,048
November (1-6)	2,720	2,070	2,337	0.292	0.07	27,812
The period					7.01	2,985,337

MISCELLANEOUS DISCHARGE MEASUREMENTS in Bow River Drainage Basin, in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Square-ft.</i>	<i>Fl. per Sec.</i>	<i>Sec.-ft.</i>
Sept. 20.....	H. Brown.....	Bath Creek.....	N.E. 32-28-16-5	36 5	26 90	2.62	70.50
Oct. 17.....	J. A. Newhall..	do	do	35 2	20 38	1.715	34.94
Nov. 2.....	do	do	do	34 5	16 93	1.624	27.50
Nov. 21....	do	do	do	34 5	14 28	1.48	22.90
Dec. 6	do	do	do	33 0	13 12	1.506	19.76
Dec. 18.....	do	do	do	34 0	12 20	1.105	13.99
May 3.....	H. C. Ritchie...	Beaupre Creek....	Sec. 15-26-5-5	5 5	2 23	0.31	Dry.
July 14.....	L. R. Brereton	do	do	8 30	3 95	0.65	0.69
Aug. 18.....	do	do	do	7 50	2 32	0.22	2.56
Sept. 19....	do	do	do				0.51
Oct. 20.....	do	do	do	*			
May 3.....	H. C. Ritchie...	Bighill Creek.....	Sec. 10-26-4-5...	11 00	6 04	0.97	5.88
July 14.....	L. R. Brereton..	do	do	11 40	6 82	1.05	7.18
Aug. 18.....	do	do	do	12 3	9 50	1.30	12.50
Sept. 19....	do	do	do	11 3	6 40	1.00	6.43
Oct. 20.....	do	do	do	11 4	7 97	0.46	3.71
Jan. 7.....	H. R. Carscallen	Elbow River.....	S.E. 25-23-2-5..	55 0	82 00	1.097	89.98
Feb. 7.....	do	do	do	50 0	85 70	1.123	96.22
Mar. 13.....	G. H. Whyte & (L. J. Gleeson)	do	S.E. 15-22-6-5...	44 0	50 80	2.230	113.45
Mar. 14.....	do	do	Sec. 15-22-6-5 Below mouth of Canyon Creek	45 0	55 55	2.044	113.51
Mar. 14....	do	do	Sec. 15-22-6-5 Above mouth of Canyon Creek	51 0	70 85	1.306	92.56
Mar. 14.....	H. R. Carscallen.	do	Sec. 15-22-6-5 Above mouth o Canyon Creek	45 00	94 35	1.200	113.22
July 27.....	L. R. Brereton	do	do	96 0	228 57	2.58	589.59
Sept. 4.....	do	do	do	107 5	380 67	3.83	1459.56
Sept. 25.....	do	do	do	74 0	208 71	2.04	425.28
Apr. 26.....	H. R. Carscallen.	Fish Creek N. Br...	Sec. 22-22-3-5...	19 5	10 63	0.882	9.38
July 18....	L. R. Brereton..	do	N.E. do	16 0	10 84	0.63	6.85
July 18.....	do	Fish Creek, S. Br...	S.E. do	23 0	26 82	0.78	20.80
Aug. 23.....	do	do	S.E. do	36 0	38 82	1.03	39.98
do	do	Fish Creek, N. Br	Sec. 22-22-3-5...	17 2	14 07	1.20	16.85
Sept. 27.....	do	do	N.E. do	19 7	24 41	0.93	22.81
do	do	do S. Br.	S.E. do	36 7	41 67	1.05	43.79
May 3.....	H. C. Ritchie...	Grand Valley Crk.	Sec. 24-26-5-5....	x 9 7	5 43	0.97	1.5
July 14.....	L. R. Brereton..	do	do	10 2	9 95	1.39	5.28
Aug. 18.....	L. R. Brereton..	Grand Valley Crk.	Sec. 13-26-5-5...				13.81
Sept. 19.....	do	do	Sec. 24-26-5-5...	9 6	5 88	0.97	5.73
Oct. 20.....	do	do	do	5 7	2 46	0.89	2.19
Sept. 1.....	do	Highwood River...	Sec. 16-18-2-5...	143 5	159 93	2.59	401.99
Oct. 7.....	do	do	S.W. 16-18-2-5	143 5	151 47	2.49	376.98
May 3.....	H. C. Ritchie...	Horse Creek.....	Sec. 8-26-4-5 ..				†
July 14.....	L. R. Brereton..	do	do	1 5	0 60	0.60	0.36
Aug. 18.....	do	do	do	9 7	2 81	0.43	1.22
Sept. 19.....	do	do	do	5 0	0 98	0.18	0.18
Oct. 20.....	do	do	do	4 0	0 74	0.14	0.10
June 17.....	do	Lineham Spillway	N.W. 6-19-28-4.	6 4	3.66	1.11	3.7
July 22.....	do	do	do	9 0	6.30	1.49	9.40
Aug. 29.....	do	do	do	7 80	4 16	1.63	6.79
Oct. 4.....	do	do	do	7.90	5 40	1.68	9.05
May 3.....	H. C. Ritchie...	Spencer Creek.....	Sec. 17-26-5-5 ..	7.60	4 87	0.55	x1.00
July 14.....	L. R. Brereton..	do	do				2.67
Aug. 18.....	do	do	do	9 80	7 70	0.91	7.59
Sept. 19.....	do	do	do	9.70	7.35	0.64	4.72
Oct. 20.....	do	do	do	9 80	7 19	0.61	4.40
Aug. 31.....	do	Stimson Creek.....	Sec. 14-17-2-5...	27.0	26 65	0.49	13.03
July 24.....	L. R. Brereton..	Tongue Flag Crk..	S.W. 19-19-28-4	8 7	2.64	0.96	2.55
Aug. 29....	do	do	do	10 6	3 34	1.30	4.35
Oct. 3.....	do	do	do	10.9	4 19	1.575	6.60

* Creek frozen solid. x Approximate. † Too small to gauge.

SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS of Mineral Water Springs near Banff, Alta., in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.		Area of Section.	Discharge.
				Feet.	Sq. Feet.		Sec. Feet.
July 13.	P. M. Sauder....	Kidney Spring.....	Banff, Alta.	*			0 078
July 13..	do ...	Middle Spring.....	do	*			0.256
July 14....	do ...	Over Flow From (Cave)	do	*			0 293
Aug. 24.	do ...	Upper Hot (Spring)	do	**			0.350

* Discharge measured with a 9 in. weir. ** Discharge measured with two 9 in. weirs.

TEMPERATURES of Mineral Water Springs near Banff, Alta., in 1911.

Date.	NAME.	LOCALITY.	Hydrographer.	Temperature	
July 8.....	Overflow from upper Hot Spring.....	Banff, Alta....	P. M. Sauder....	114°	F.
July 11... ..	do	do	do	114 5°	F.
July 12.....	Feed pipe for swimming Pool Upper Hot Springs.....	do	do	114°	F.
July 12.....	In well at Upper Hot Spring.....	do	do	114 25°	F.
July 12.....	Kidney Spring.....	do	do	100 4°	F.
July 15.....	Swimming Basin near Cave.....	do	do	93°	F.
July 15..	Sulphur Spring above Cave.....	do	do	88°	F.
July 15.....	Iron Spring above Cave.....	do	do	88°	F.
July 15.....	Spring in Cave.....	do	do	86 5°	F.
July 15.....	Middle Spring (Upper).....	do	do	94°	F.
July 15.....	Middle Spring (Lower).....	do	do	94°	F.
July 15.....	Kidney Springs.....	do	do	100 5°	F.

LITTLE BOW RIVER DRAINAGE BASIN.

General Description.

The source of Little Bow river is a spring in the Town of High River in Sec. 6, Tp. 19, Rge. 28, W. 4th Mer. From here it flows in a southeasterly direction for one hundred miles and empties into Belly river. In the first few miles, the natural flow is dependent entirely on a number of small springs and coulees which are dry most of the year, but later is augmented by the flow from Mosquito Creek, which drains the south and westerly part of the drainage basin. There is a comparatively large flow in this stream during the spring freshets, but during summer it would under natural conditions dry up. There are a large number of ranchers and settlers on this stream, and it is very important that there should be a good flow for domestic and stock-watering purposes. For this reason, the Provincial Government has constructed a canal and diverts water from Highwood River into Little Bow River whenever required.

MOSQUITO CREEK NEAR NANTON, ALTA.

This station was established August 1, 1908, by H. C. Ritchie. It is located at a traffic bridge, about four miles from Nanton, on the road from Nanton to Cayley. The bridge is on a road diversion on Sec. 30, Tp. 16, Rge. 28, W. 4th Mer. The gauge, which is a plain staff graduated to feet and hundredths, is fixed in a stilling box in the left bank, a few yards upstream from the bridge. It is referred to two spike-heads in the south side of the bridge pier at the right bank of the stream; elevation, 11.47. The channel is straight for about 175 feet below the station, then curves to the left. Above the station the channel curves slightly to the left for about 500 feet, then it turns sharply to the left. The right bank is low near the water's edge, but is high a few feet from it. Sand and mud

are deposited on this bank in high water. The left bank is high, and is of solid clay with a few boulders. There is only one channel at low water. The bridge piers divide the stream into three channels at flood stage.

Discharge measurements are made from the bridge at high-water and flood stages. The initial point for soundings is the north end of the bridge. The current is very sluggish at the bridge during low water, and during this stage discharge measurements are made at wading sections, some distance above or below the bridge.

During 1911, the gauge was read daily by G. S. Caspell, who lives about 1,200 feet north of the bridge.

DISCHARGE MEASUREMENTS of Mosquito Creek near Nanton, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Fl. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Apr. 19	J. E. Degnan	15.0	10.03	0.591	2.78	5.93
May 8	do	14.0	3.81	0.755	2.38	2.88
June 1	A. W. P. Lowrie	14.8	6.94	1.03	2.61	7.18
June 19	do	13.6	3.10	0.38	2.30	1.17
July 8	do	14.0	4.59	0.76	2.45	3.48
July 25	do	10.7	2.20	0.69	2.34	1.52
Aug. 14	do	25.3	21.81	0.52	2.66	11.30
Aug. 30	do	24.3	17.70	0.34	2.56	5.97
Sept. 27	do	25.4	21.69	0.58	2.71	12.65
Oct. 24	N. M. Sutherland	24.3	19.26	0.50	2.64	9.66

DAILY GAUGE-HEIGHT AND DISCHARGE of Mosquito Creek near Nanton, Alta., for 1911.

DAY.	April.		May.		June.		July.	
	Gauge Height	Dis-charge	Gauge Height.	Dis-charge	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	2 23	0 4	2 35	1 8	2 46	3 9	2 71	14 0
2	2 23	0 4	2 32	1 3	2 46	3 9	2 65	10.0
3	2 23	0 4	2 30	1 0	2 46	3 9	2 50	4.7
4	2 33	0 4	2 30	1 0	2 46	3 9	2 45	3.6
5	2 23	0 4	2 30	1 0	2 46	3 9	2 45	3.6
6	2 23	0 4	2 25	0 6	2 45	3 6	2 45	3.6
7	2 23	0 4	2 25	0 6	2 43	3 2	2 39	2.4
8	2 66	8 1	2 25	0 6	2 42	3 0	2 34	1 6
9	2 76	17 0	2 24	0 5	2 42	3 0	2 37	2.1
10	2 85	26 0	2 24	0 5	2 34	1 6	2 39	2.4
11	2 85	26.0	2 24	0 5	2 26	0 7	2 46	3.9
12	2 75	16.0	2 24	0 5	2 20	0 2	2 44	3.4
13	2 65	10 0	3 06	57 0	2 34	1 6	2 43	3.2
14	2 65	10 0	3 02	50 0	2 36	2 0	2 42	3.0
15	2 70	13 0	2 54	5.9	2 36	2 0	2 42	3.0
16	2 60	7 8	2 54	5 9	2 34	1 6	2 41	2.8
17	2 57	6 9	2 75	16 5	2 34	1 6	2 42	3.0
18	2 62	8 8	2 59	7 5	2 15	0 2	2 35	1.8
19	2 57	6 9	2 52	5 3	2 14	0 1	2 44	3.4
20	2 57	6.9	2 46	3 9	2 12	0 1	2 42	3.0
21	2 54	5 9	2 47	4 1	2 10	0 1	2 38	2.3
22	2 54	5 9	2 49	4 5	2 15	0 2	2 35	1.8
23	2 50	4.7	2 67	11 4	2 33	1 5	2 30	1.0
24	2 50	4 7	2 70	13 0	2 30	1 0	2 25	0.6
25	2 48	4 3	2 70	13 0	2 32	1 3	2 22	0.4
26	2 47	4 1	2 52	5 3	2 35	1 8	2 20	0.2
27	2 51	5 0	2 57	6 9	2 40	2 6	2 17	0.2
28	2 51	5 0	2 60	7 8	2 42	3 0	2 14	0.2
29	2 46	3 9	2 62	8 8	2 46	3 9	2 11	0.1
30	2 44	3.4	2 64	9 9	3 05	5 5	2 15	0.2
31			2 60	7 8			2 21	0.3

DAILY GAUGE-HEIGHT AND DISCHARGE of Mosquito Creek near Nanton, Alta., for 1911.—*Con.*

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2 25	0 6	2 35	1 8	2 50	4 7	2 50	4.7
2	2 28	0 8	2 34	1 6	2 56	6 6	2 52	5.3
3	2 27	0 8	2 39	2 4	2 58	7 2	2 53	5 6
4	2 25	0 6	2 49	4 5	2 60	7 8	2 53	5.6
5	2 30	1 0	2 68	12 0	2 61	8 3	2 54	5.9
6	2 70	13 0	2 81	21 0	2 57	6 9	2 55	6.2
7	2 80	20 0	2 76	17 0	2 55	6 2	2 60	7.8
8	2 85	26 0	2 79	19 0	2 55	6 2	2 66	10.9
9	2 91	32 5	2 68	12 0	2 54	5 9	2 69	12 5
10	2 90	31 0	2 59	7 5	2 54	5 9	2 66	10.9
11	2 87	28 0	2 55	6 2	2 53	5 6	2 64	9.9
12	2 84	24 0	2 51	5 0	2 52	5 3	2 64	9.9
13	2 74	16 0	2 48	4 3	2 51	5 0	2 64	9 9
14	2 61	8 3	2 46	3 9	2 50	4 7	2 64	9.9
15	2 57	6 9	2 44	3 4	2 50	4 7	2 64	9.9
16	2 55	6 2	2 42	3 0	2 45	3 6		
17	2 53	5 6	2 47	4 1	2 45	3 6		
18	2 52	5 3	2 47	4 1	2 46	3 9		
19	2 51	5 0	2 47	4 1	2 45	3 6		
20	2 49	4 5	2 50	4 7	2 46	3 9		
21	2 48	4 3	2 50	4 7	2 46	3 9		
22	2 47	4 1	2 50	4 7	2 46	3 9		
23	2 46	3 9	2 55	6 2	2 47	4 1		
24	2 45	3 6	2 57	6 9	2 51	5 0		
25	2 40	2 6	2 55	6 2	2 54	5 9		
26	2 42	3 0	2 55	6 2	2 38	2 3		
27	2 44	3 4	2 55	6 2	2 44	3 4		
28	2 46	3 9	2 55	6 2	2 46	3 9		
29	2 43	3 2	2 53	5 6	2 48	4 3		
30	2 40	2 6	2 50	4 7	2 50	4 7		
31	2 45	3 6			2 50	4 7		

MONTHLY DISCHARGE of Mosquito Creek near Nanton, Alta., for 1911.

(Drainage area, 183 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	26.0	0.4	7.10	.039	.04	422
May	57.0	0.5	8.21	.045	.05	505
June	5.5	0.1	2.16	.012	.01	129
July	14.0	0.1	2 77	.015	.02	170
August	32.5	0.6	8 85	.048	.06	544
September	21.0	1.6	6.34	.035	.04	377
October	8.3	2.3	5.02	.027	.03	309
November (1-15)	12.5	4.7	8.33	.046	.03	239
The period						2,695

NANTON CREEK NEAR NANTON, ALTA.

This station was established August 3, 1908, by P. M. Sauder. It is located at George Topper's farm, near Nanton. It is on Sec. 20, Tp. 16, Rge. 28, W. 4th Mer., and almost directly west of Mr. Topper's stable.

The gauge, which is a plain staff graduated to feet and hundredths, is driven vertically into the bed of the stream, at the left bank. It is attached by braces to posts in the bank. The bench-mark is the top of a hub (wood stake with iron cap) on the right bank, about 75 feet south-east from the gauge; elevation 17.82 above the zero of the gauge.

This stream follows a very crooked course, but the channel is nearly straight for about 125 feet above and about 75 feet below the gauge. The banks are well defined but not high, and may overflow in excessive floods. They are composed of clay and covered with tough sod. The bed of the stream is composed of gravel, not liable to shift, and free from vegetation.

Discharge measurements are made by wading at or near the gauge. At flood stage, discharge measurements may be made at Mr. Topper's bridge, about 1,000 feet downstream from the gauge.

During 1911, the gauge was read by Mr. George Topper.

DISCHARGE MEASUREMENTS of Nanton Creek, near Nanton, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Apr. 19	J. E. Degnan.....	6.0	1.90	0.437	5.18	0.83
May 8	do	3.8	1.85	0.383	5.13	0.71
June 1	A. W. P. Lowrie....	8.0	6.31	0.63	5.54	3.97
June 19	do	7.4	3.48	0.33	5.18	1.13
July 8	do	7.6	5.08	0.61	5.42	3.11
July 25	do	7.6	4.26	0.46	5.24	1.98
Aug. 14..	do	7.5	7.66	1.12	5.91	8.60
Aug. 30	do	7.0	6.50	0.88	5.73	5.71
Sept. 27	do	7.4	8.36	1.02	5.85	8.49
Oct. 24	N. M. Sutherland..	7.0	7.97	0.90	5.77	7.16

DAILY GAUGE-HEIGHT AND DISCHARGE of Nanton Creek near Nanton, Alta., for 1911.

DAY.	April.		May.		June.		July.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	5 05	0 30	5 00	0 05	5 50	3 50	5 70	5 90
2	5 20	1 10	5 00	0 05	5 40	2 55	5 90	8.75
3.....	5 20	1 10	5 00	0 05	5 43	2 84	5 55	4.08
4	5 15	0 82	5 00	0 05	5 30	1 75	5 45	3.02
5.....	5 10	0 55	5 00	0 05	5 30	1 75	5 45	3.02
6	5 02	0 15	5 00	0 05	5 30	1 75	5 40	2 55
7	5 02	0 15	5 00	0 05	5 30	1 75	5 35	2.15
8.....	5 02	0 15	5 00	0 05	5 25	1 42	5 25	1.42
9	5 20	1 10	5 00	0 05	5 25	1 42	5 25	1.42
10.....	5 30	1 75	5 00	0 05	5 25	1 42	5 25	1.42
11	5 40	2 55	5 00	0 05	5 20	1 10	5 25	1.42
12.....	5 30	1 75	5 00	0 05	5 20	1 10	5 25	1.42
13.....	5 03	0 20	5 05	0 30	5 30	1 75	5 25	1.42
14	5 05	1 30	5 75	6 60	5 40	2 55	5 25	1.42
15	5 05	0 30	5 45	3 02	5 40	2 55	5 20	1.10
16.....	5 09	0 50	6 05	10.9	5 30	1 75	5 20	1.10
17.....	5 09	0 50	5 40	2 55	5 20	1 10	5 20	1.10
18.....	5 09	0 50	5 30	1 75	5 05	0 30	5 20	1.10
19	5 10	0 55	5 20	1 10	5 05	0 30	5 20	1.10
20.....	5 09	0 50	5 15	0 82	5 05	0 30	5 30	1.75
21.....	5 09	0 50	5 05	0 30	5 10	0 55	5 30	1.75
22.....	5 10	0 55	5 05	0 30	5 15	0 82	5 25	1.42
23.....	5 09	0 50	5 40	2 55	5 20	1 10	5 25	1.42
24.....	5 08	0 45	5 60	4 65	5 20	1 10	5 25	1.42
25	5 10	0 55	5 70	5 90	5 55	4 08	5 28	1.62
26	5 09	0 50	5 80	7 30	5 40	2 55	5 25	1.42
27	5 00	0 05	5 84	7 88	5 35	2 15	5 30	1.75
28.....	5 05	0 30	5 88	8 46	5 98	9 91	5 30	1.75
29.....	5 06	1 35	5 85	8 02	6 55	18.3	5 30	1.75
30	5 03	0 20	5 65	5 27	5 85	8.02	5 30	1.75
31.....			5 60	4 65			5 30	1.75

DAILY GAUGE-HEIGHT AND DISCHARGE of Nanton Creek near Nanton, Alta., for 1911.—Con.

DAY.	August.		September.		October.		November.	
	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.32	1 91	5.69	5 78	5 75	6 60	6 06	11.1
2.....	5.33	1 99	5 68	5 65	6 93	24 00	6 06	11.1
3.....	5.35	2 15	5 73	6 32	6 05	10 9	5 98	9.91
4.....	5.35	2 15	6 65	19 8	5 95	9 47	5 95	9 47
5.....	5.60	4 65	6 60	19 0	5 83	7 74	5 95	9.47
6.....	5.95	9 47	6 55	18 3	5 83	7 74	5 95	9.47
7.....	6.90	23 3	6 35	15 3	5 80	7 30	5 65	5.27
8.....	7.50	32 5	6 05	10 9	5 75	6 60	5 67	5.52
9.....	6 65	19 8	5 95	9 47	5 75	6 60	5 67	5.52
10.....	6.30	14 6	5 93	9 18	5 75	6 60	5 67	5.52
11.....	6 15	12 4	5 86	8 17	5 75	6 60	5 67	5.52
12.....	6.05	10 9	5 83	7 74	5 75	6 60	5 69	5.78
13.....	6.00	10 2	5 80	7 30	5 75	6 60	5 69	5.78
14.....	5 94	9 33	5 75	6 60	5 75	6 60	5 69	5.78
15.....	5.90	8 75	5 74	6 46	5 71	6 04	5 69	5.78
16.....	6.00	10 2	5 73	6 32	5 71	6 04		
17.....	5 90	8 75	5 91	8 89	5 71	6 04		
18.....	5 90	8 75	5 92	9 04	5 72	6 18		
19.....	5.85	8 02	5 82	7 59	5 72	6 18		
20.....	5.85	8 02	5 80	7 30	5 72	6 18		
21.....	6.00	10 2	5 84	7 88	5 73	6 32		
22.....	5.95	9 47	5 88	8 46	5 73	6 32		
23.....	5.85	8 02	5 91	8 89	5 73	6 32		
24.....	5.83	7 74	5 95	9 47	5 75	6 60		
25.....	5.85	8 02	5 95	9.47	5 62	4 90		
26.....	6.20	13.1	5 93	9 18	5 85	8 02		
27.....	5.90	8 75	5 85	8 02	6 02	10 5		
28.....	5.87	8 32	5 82	7.59	6 02	10 5		
29.....	5.75	6 60	5 78	7 02	6 10	11 7		
30.....	5.70	5 90	5 75	6.60	6 10	11 7		
31.....	5.65	5 27			6 10	11 7		

MONTHLY DISCHARGE of Nanton Creek near Nanton, Alta., for 1911.

(Drainage area, 44 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April.....	2.55	0.20	0.627	0.014	0.02	37
May.....	10.90	0.05	2.67	0.061	0 07	164
June.....	18.30	0.30	2.71	0.062	0.07	161
July.....	8.75	1 10	2.08	0.047	0 05	128
August.....	32.50	1.91	9 65	0.219	0 25	593
September.....	19.80	5 65	5 92	0.134	0 15	352
October.....	24.00	4.90	8.10	0.184	0.21	498
November (1-15).....	11.10	5.52	7.40	0 168	0.10	220
The period.....						

MISCELLANEOUS DISCHARGE MEASUREMENTS in Little Bow River drainage basin, in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. Feet.	Fl. per Sec.	Sec. Feet.
June 28.	J. C. Milligan..	Mosquito Creek....	N.E. 8-16-1-5....	x			0.78
do	do	Snake Creek.....	N.E. 17-16-1-5..	x			0.454

x Weir measurement.

OLDMAN RIVER DRAINAGE BASIN

General Description.

Oldman river, one of the principal tributaries of the South Saskatchewan River, is formed in the Livingstone range of the Rocky mountains by the junction of four small rivers, viz., Livingstone, Northwest Branch, West Branch and Racehorse Creek, and flows in a southeasterly direction to near Cowley, where it is joined by the Crowsnest and Southfork rivers. Between Cowley and Kipp, where it empties into the Belly River, the Oldman river is augmented by numerous small rivers and creeks, its course being easterly and northerly. It drains the area bounded on the north by the parallel of latitude through 50° 20', on the south by the parallel through 49° 20', and on the west by the Great Divide, this area being estimated to contain about 2, 235 square miles, with topography varying from mountainous to rolling prairie.

The bed of the river is of rock and gravel, and has a large fall with consequent swift water, interspersed with falls and rapids, but it changes to quicksand and mud after reaching the prairie region where the current is more sluggish.

The flow of this river, draining as it does mountain ranges with peaks extending above the snow line, is subject to great changes, caused by melting snow and heavy summer rains in the mountains. Floods occur regularly in both May and June, the one in June generally rising higher and lasting longer. From this time on, however, the flow is normally steady, but gradually decreases until the minimum is reached during January and February.

The precipitation throughout the basin, consequently, is quite large. Though almost entirely under cultivation, where practicable, this area has little need of irrigation. Owing to the depth of the valley and its steep rocky banks irrigation from this river would be enormously expensive, if not altogether impossible, but there are many excellent power-sites at its falls and rapids. Up to the present, no power has been developed on this river, but investigations with that end in view are being made.

DISCHARGE MEASUREMENTS of Burton Ditch, at N.W. 36-11-1-5, (Alta.), in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Inches.</i>	<i>Sec.-ft.</i>
Oct. 13.....	J. C. Milligan.....	....	....	....	0'-1 ¹ / ₄ "	0.0689*
Oct. 13.....	do .....	....	....	....	0'-2 ³ / ₄ "	0.224 *
Oct. 13.....	do .....	....	....	....	0'-3"	0.2714*
Oct. 13.....	do .....	....	....	....	0'-3 ¹ / ₄ "	0.3226*

* Weir measurement.

DISCHARGE MEASUREMENTS of Burton Ditch River at S.W. 1-12-1-5(Alta.), in 1911.

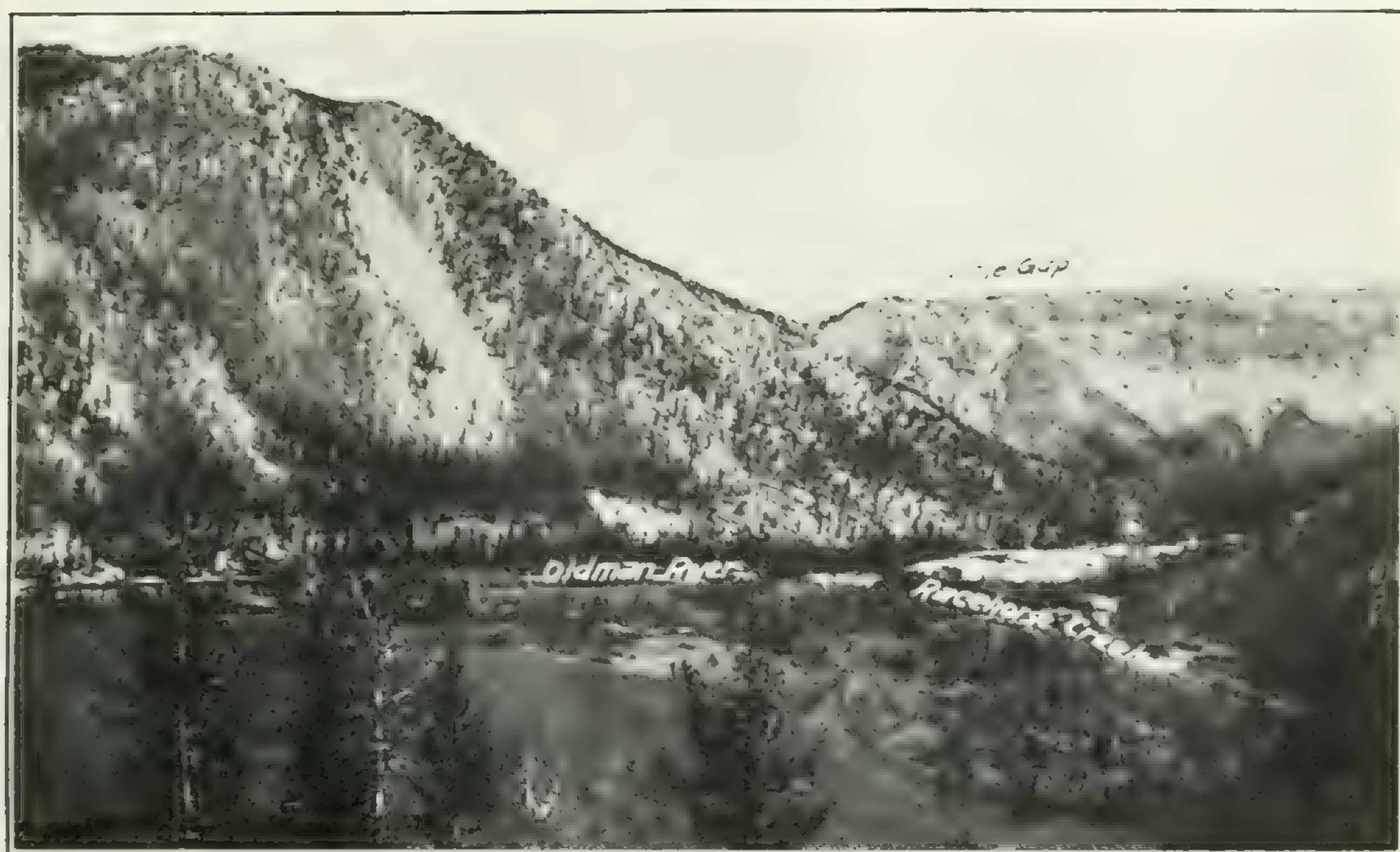
Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Inches.</i>	<i>Sec.-ft.</i>
Oct. 13.....	J. C. Milligan.....	....	....	....	0'-1"	0.033*
Oct. 13.....	do .....	....	....	....	0'-2 ¹ / ₂ "	0.260*
Oct. 13.....	do .....	....	....	....	0'-3 ¹ / ₂ "	0.414*
Oct. 13.....	do .....	....	....	....	0'-3 ³ / ₄ "	0.530*

* Weir measurement.

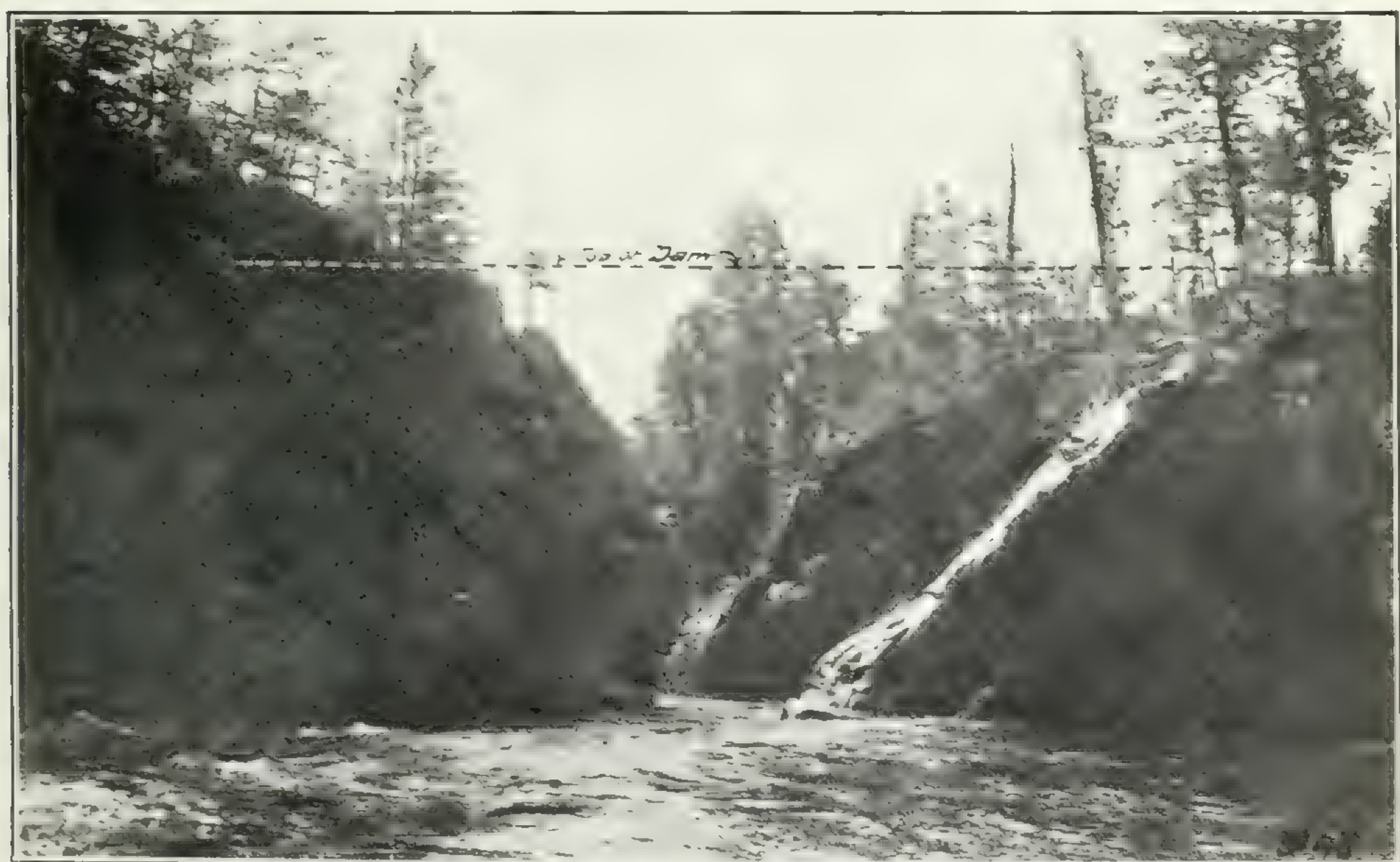
TROUT CREEK AT STEVENSON'S FARM.

This station was established May 14, 1909, by H. C. Ritchie. It is located at the traffic bridge on the road allowance east of the S.E. ¹/₄ Sec. 12, Tp. 12, Rge. 28, W. 4th Mer., and is about seven miles southwest of Claresholm.

The gauge, which is a plain staff graduated to feet and hundredths, is fastened to the left abutment of the bridge. It is referred to a bench-mark on top of the outer, downstream pile of the same abutment. (elevation, 7.99 feet above the zero of the gauge).



Looking East into "The Gap" on Oldman River. Taken by F. H. Peters.



Dam Site on Oldman River near "The Gap", looking down stream. Taken by F. H. Peters.

SESSIONAL PAPER No. 25d

The channel is straight for sixty feet above and fifty feet below the station. Both banks are low, wooded, and liable to overflow during high water. The bed of the stream is sand and gravel. The current is fairly swift.

Discharge measurements are made from the bridge during high water, the initial point for soundings being on line with the inner face of the left abutment. During low water the stream is waded at the same section.

During 1911, the gauge was read by Mr. John Stevenson.

DISCHARGE MEASUREMENTS of Trout Creek at Stevenson's Farm, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Apr. 18.....	J. E. Degnan.....	28.2	15.75	0.698	0.95	11.02
May 5.....	do.....	28.2	12.78	0.611	0.83	7.81
May 31.....	A. W. P. Lowrie.....	.....	31.02	1.72	1.50	53.42
June 17.....	do.....	28.5	21.39	1.14	1.20	24.50
July 7.....	do.....	28.4	19.71	0.92	1.13	18.27
Sept. 23.....	do.....	28.3	45.97	2.01	1.98	92.21
Oct. 20.....	N. M. Sutherland.....	28.5	32.19	1.48	1.48	47.64

DAILY GAUGE-HEIGHT AND DISCHARGE of Trout Creek at Stevenson's Farm, Alta., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis. charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			*1.02	14.8	*.82	6.2	*1.57	55.3
2.....			*1.05	16.7	.80	5.2	1.60	57.8
3.....			*1.08	18.6	*.83	6.2	1.55	53.7
4.....			1.10	19.2	.85	6.9	*1.55	53.7
5.....			*1.05	16.7	*.85	6.9	1.55	53.7
6.....			1.00	13.6	.85	6.9	1.52	51.2
7.....			*.95	11.1	*.85	6.9	1.50	49.6
8.....			.90	8.6	*.85	6.9	*1.47	47.1
9.....			*.95	11.1	.85	6.9	1.44	44.7
10.....			1.00	13.6	.85	6.9	1.40	41.4
11.....			*1.00	13.6	*.85	6.9	*1.37	39.1
12.....			1.00	13.6	.85	6.9	1.35	37.5
13.....			*.96	11.6	1.05	6.7	*1.33	35.9
14.....			*.93	10.1	1.18	25.1	1.30	33.6
15.....			.90	8.6	*1.40	41.4	*1.26	30.7
16.....			*.92	9.6	1.63	60.4	*1.23	28.6
17.....			*.94	10.6	1.45	45.5	1.20	26.4
18.....			.95	11.1	*1.37	39.1	*1.16	23.8
19.....			*.97	12.1	1.30	33.6	1.12	21.1
20.....			1.00	13.6	1.28	32.2	*1.12	21.1
21.....			*1.02	14.8	1.22	27.8	*1.11	20.5
22.....			1.04	16.1	*1.26	30.7	1.11	20.5
23.....			*1.01	14.2	1.31	34.4	1.11	20.5
24.....			*.98	12.6	1.34	36.7	1.34	33.6
25.....			.95	11.1	1.40	41.4	1.40	41.4
26.....			.95	11.1	*1.43	43.9	1.30	33.6
27.....	1.00	13.6	*.94	10.6	1.45	45.5	1.20	26.4
28.....	1.00	13.6	*.92	9.6	*1.39	40.6	1.20	26.4
29.....	*1.00	13.6	.90	8.6	1.34	36.7	*1.20	26.4
30.....	*1.00	13.6	*.86	7.2	*1.43	43.9	1.21	27.1
31.....	1.00	13.6			1.53	52.1		

DAILY GAUGE-HEIGHT AND DISCHARGE of Trout Creek at Stevenson's Farm, Alta.,
for 1911.—Continued.

DAY.	July.		August.		September.		October.	
	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1..	*1 24	28 6	1 23	28 6	1 35	37 5	*1.74	70.1
2 ..	1 25	30 0	1 20	26 4	1 35	37 5	*1.75	71.0
3.....	1 18	25 1	1 12	21 1	*1 82	77 4	1.75	71.0
4 ..	1 16	23 8	1 12	21 1	2 30	123	*1 74	70.1
5 ..	1 20	26 4	1 23	28 6	2 10	104	*1.72	68.3
6 ..	*1 17	24 4	*1 81	76 4	2 55	146	1 70	66.5
7 ..	1 13	21 8	2 40	132	2 65	156	*1.65	62.1
8 ..	*1 12	21 1	*2 40	132	2 50	142	1 60	57.8
9 ..	*1 11	20 5	2 40	132	2 60	151	*1.60	57.8
10 ..	1 11	20 5	2 30	123	*2 65	156	*1 60	57.8
11 ..	1 13	21 8	*2 25	118	2 70	161	*1.60	57.8
12.....	1 13	21 8	2 20	113	2 60	151	*1.60	57.8
13.....	1 11	20 5	*2 14	107	*2 50	142	1 60	57.8
14...	*1 09	19 2	2 09	103	2 40	132	*1 57	55.3
15.....	1 07	17 9	2 12	106	*2 36	128	1.55	53.7
16.....	*1 07	17 9	*2 04	97 9	*2 32	124	*1.53	52.1
17.....	1 07	17 9	*1 97	91 3	*2 28	121	1 50	49.6
18 ..	*1 06	17 3	1 90	84 8	*2 24	117	*1 49	48.8
19.....	1 05	16 7	1 70	66 5	2 20	113	*1 48	48.0
20 ..	*1 04	16 1	*1.66	63 0	*2 15	108	1.47	47.1
21.....	*1 03	15 5	*1 63	60 4	*2 10	104	*1 48	48.0
22.....	1 02	14 8	1 60	57 8	*2 05	98 8	1 50	49.6
23.....	*1 02	14 8	*1 57	55 3	2 00	94 1	1 46	46.3
24 ..	1 03	15 5	1 53	52 1	*2 00	94 1	*1 43	43.9
25.....	*1 02	14 8	*1 56	54 5	2 00	94.1	*1 40	41.4
26 ..	1 01	14 2	1 59	57 0	*1 95	89.4	1 37	39.1
27 ..	1 00	13 6	*1 55	53 7	1 90	84 8	*1.40	41.4
28.....	1 00	13 6	1 52	51 2	1 90	84 8	*1 43	43.9
29.....	*1 05	16 7	*1 47	47 1	*1 82	77.4	*1 45	45.5
30.....	1 10	19 8	*1 42	43 0	1 74	70 1	1 48	48.0
31.....	1.10	19 8	1 37	39 1	.....	.....	1.38	39.8

* No observation. Gauge-height interpolated.

MONTHLY DISCHARGE of Trout Creek at Stevenson's Farm, Alta., for 1911.

(Drainage area, 168 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
March	13.6	13.6	13.6	.081	.02	135
April	19.2	7.2	12.5	.074	.08	744
May	*60.4	5.2	25.7	.153	.17	1,580
June ..	57.8	20.5	36.1	.215	.24	2,148
July.....	30.0	13.6	19.4	.116	.13	1,193
August	132.0	21.1	72.4	.431	.50	4,452
September	161.0	37.5	111.0	.661	.74	6,605
October	71.0	39.1	53.8	.320	.37	3,308
The period . . . . .	.....	.....	.....	.....	.....	20,165

TROUT CREEK AT LOCKWOOD'S RANCHE.

This station was established on July 7, 1911, by A. W. P. Lowrie. It is located on Sec. 33, Tp. 11, Rge. 28, W. 4th Mer., and is about 180 feet from Mr. Lockwood's house. The gauge, which is a plain staff graduated to feet and hundredths, is fastened to the stump of a tree on the right bank. The zero of the gauge (elev., 90.30) is referred to a notch in a tree about seventy feet downstream (assumed elev., 100.00). The channel is straight for eighty feet above and seventy feet below the gauge. The right bank is wooded and may overflow during high water. The left bank is wooded and low. The bed of the channel is stony, and not liable to shift. Discharge measurements are made by wading about twenty feet upstream from the gauge. The initial point for soundings is a post on the left bank. The gauge was read by Mr. Barr, who lives on Mr. Lockwood's ranche. Tables of daily and monthly discharge for 1911 have not yet been computed. These will be finished during 1912 and published with the records for that year.

DISCHARGE MEASUREMENTS of Trout Creek at Lockwood's Ranche, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
July 24	A. W. P. Lowrie.....	29.20	24.98	0.64	3.45	16.10
Aug. 12	do	41.90	51.70	2.24	4.65	115.81
Aug 29	do	30.30	37.39	1.04	3.90	39.09
Sept 25	do	41.0	44.26	2.03	4.45	89.98*
Oct. 20	N. M. Sutherland.....	28.0	39.92	1.14	4.00	45.50

* Gauged 600 ft. below regular station.

MUDDYPOUND CREEK AT HART'S RANCHE.

This gauging station, located on the S.W. ¼ Sec. 27, Tp. 11, Rge. 28, W. 4th Mer., at the foot-bridge on L. O. Hart's ranche, was established July 27, 1908, by H. C. Ritchie. The gauge is a plain staff, graduated to feet and hundredths, placed at the left bank fifteen feet upstream from the bridge. It is referred to a bench-mark on an iron iron pin near a post 35 feet northeast of the gauge; elevation 8.94. The channel is straight for 30 feet above and 110 feet below the station. Both banks are high, clayey, and liable to overflow in extreme floods. The bed is of clean gravel. The current is fairly swift. Discharge measurements are made from the bridge in high water, the initial point for soundings being marked at the left end of the bridge. In low stages the creek is waded about 100 feet upstream. During 1911, the gauge was read by Mrs. M. E. Hart.

DISCHARGE MEASUREMENTS of Muddypound Creek at Hart's Ranche, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 6	J. E. Degnan.....	13.80	10.00	0.359	2.18	3.59
May 18	do	14.0	10.41	0.415	2.20	4.32
May 30	A. W. P. Lowrie.....	13.30	11.48	0.58	2.29	6.70
June 17	do	13.90	9.53	0.32	2.15	3.08
July 7	do	7.00	1.99	0.79	2.13	1.58*
July 24	do	6.40	1.51	1.01	2.10	1.53
Aug. 12	do	14.00	14.33	0.97	2.55	13.92
Aug. 29	do	13.80	11.30	0.70	2.32	7.86
Sept. 25	*do	14.00	17.44	1.31	2.81	22.80
Oct. 20	N. M. Sutherland.....	14.00	13.6	0.84	2.44	11.38

* 25 yards above gauge rod.

DAILY GAUGE-HEIGHT AND DISCHARGE of Muddypound Creek at Hart's Ranche, Alta., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis- charge.	Gauge Height	Dis- charge.	Gauge Height	Dis- charge.	Gauge Height.	Dis- charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2 30	7.20	2 13	2.35	2 15	2.89
2.....			2 30	7.20	2 13	2.35	2 15	2.89
3.....			2 20	4.25	2 12	2.07	2 16	3.16
4.....			2 20	4.25	2 10	1.53	2 16	3.16
5.....			2 20	4.25	2 10	1.53	2 15	2.89
6.....			2 20	4.25	2 10	1.53	2 15	2.89
7.....			2 10	1.53	2 08	1.32	2 15	2.89
8.....			2 10	1.53	2 05	1.02	2 15	2.89
9.....			2 10	1.53	2 05	1.02	2 15	2.89
10.....			2 10	1.53	2 05	1.02	2 15	2.89
11.....			2 10	1.53	2 05	1.02	2 12	2.07
12.....			2 10	1.53	2 05	1.02	2 12	2.07
13.....			2 10	1.53	2 20	4.25	2 10	1.53
14.....			2 10	1.53	2 30	7.20	2 10	1.53
15.....			2 10	1.53	2 50	13.20	2 06	1.12
16.....			2 10	1.53	3 00	28.90	2 05	1.02
17.....			2 10	1.53	2 65	17.70	2 07	1.22
18.....			2 12	2.07	2 30	7.20	2 07	1.22
19.....			2 12	2.07	2 25	5.72	2 06	1.12
20.....	2.55	14.70	2 13	2.35	2 25	5.72	2 06	1.12
21.....	2.55	14.70	2 13	2.35	2 20	4.25	2 05	1.02
22.....	2.30	7.20	2 13	2.35	2 15	2.89	2 05	1.02
23.....	2.30	7.20	2 15	2.89	2 12	2.07	2 20	1.02
24.....	2.30	7.20	2 15	2.89	2 30	7.20	2 25	5.72
25.....	2.30	7.20	2 20	4.25	2 30	7.20	2 25	5.72
26.....	2.30	7.20	2 30	7.20	2 30	7.20	2 06	1.02
27.....	2.30	7.20	2 30	7.20	2 27	6.31	2 06	1.02
28.....	2.25	5.72	2 20	4.25	2 25	5.72	2 08	1.32
29.....	2.25	5.72	2 15	2.89	2 25	5.72	2 20	4.25
30.....	2.25	5.72	2 14	2.62	2 21	4.54	2 17	3.43
31.....	2.30	7.20			2 15	2.89		

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Muddypound Creek at Hart's Ranche, Alta., for 1911.—Continued.

DAY.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis charge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2.20	4 25	1 99	0 48	2 24	5 43	2 50	13.20	2 31	7 50
2	2.09	1 43	2 04	0 91	2 24	5 43	2 52	13.80	2 31	7.50
3	2.08	1 32	2 00	0 50	2 23	5 14	2 50	13.20	2 30	7.20
4	2.08	1 32	1 99	0 48	2 23	5 14	2 50	13.20	2 30	7.20
5	2.06	1 12	1 96	0 40	*3 65	50 35	2 50	13.20	2 28	6.61
6	2.05	1 02	2 05	1 02	2 85	24 00	2 49	12.90	2 28	6.61
7	2 05	1 02	2 64	17 4	*3 22	36 16	2 46	12.00	2 28	6.61
8	2.05	1 02	2 70	19 2	3 20	35 50	2 45	11.70	2 27	6.31
9	2.04	0 91	2 55	14 7	3 00	28 90	2 45	11.70	2 27	6.31
10	2.04	0 91	2 53	14 1	3 00	28 90	2 44	11.40	2 27	6.31
11	2.03	0 81	2 52	13 8	3 00	28 90	2 44	11.40	2 27	6.31
12	2.02	0 71	2 50	13 2	3 00	28 90	2 42	10 80		
13	2.00	0 50	2 50	13 2	3 00	28 90	2 40	10.20		
14	2.00	0 50	2 50	13 2	3 00	28 90	2 40	10.20		
15	2.00	0 50	2 50	13 2	2 98	28 24	2 40	10.20		
16	1.98	0 45	2 50	13 2	2 95	27 20	2 40	10.20		
17	1.98	0 45	2 50	13 2	2 92	26 26	2 40	10.20		
18	1.98	0 45	2 50	13 2	2 90	25 60	2 39	9.90		
19	1.98	0 45	2 40	10 2	2 87	24 64	2 39	9.90		
20	1 98	0 45	2 40	10 2	2 85	24 00	2 38	9.60		
21	1.98	0 45	2 40	10 2	2 85	24 00	2 36	9 00		
22	1.98	0 45	2 35	8 70	2 85	24 00	2 36	9.00		
23	2.00	0 50	2 35	8 70	2 80	22 40	2 35	8.70		
24	1 98	0 45	2 30	7 20	2 78	21 76	2 35	8.70		
25	1 97	0 42	2 30	7 20	2.76	21 12	2 34	8 40		
26	1.97	0 42	2.30	7 20	2.73	20 16	2 34	8.40		
27	1.97	0 42	2 28	6 61	2 71	19 52	2 33	8.10		
28	1.97	0 42	2 28	6 61	2 70	19 20	2 33	8.10		
29	1.96	0 40	2 25	5 72	2 65	17 70	2 33	8.10		
30	1.97	0 42	2 24	5 43	2 60	16 20	2 32	7.80		
31	1.97	0 42	2 24	5 43			2 32	7.80		

* Heavy rain.

MONTHLY DISCHARGE of Muddypound Creek at Hart's Ranche, Alta., for 1911.

(Drainage area, 43 square miles)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Persquare mile.	Depth in inches on Drainage area.	Total in acre-feet.
March (20-21)	14.7	5.72	8.08	0.19	0.08	192.0
April	7.2	1.53	3.12	0.73	0.81	185 6
May	28 9	1.02	5 28	0.12	0.14	325.0
June	5.72	1.02	2.30	0.053	0.59	137.0
July	4.25	0.40	0.79	0.018	0.21	49.0
August	19.2	0.40	8.86	0.206	0.24	545.0
September	50.35	5.14	24.4	0.567	0.63	1,452.0
October	13.8	7.8	10.4	0.242	0.28	640 0
November (1-11)	7.5	6.31	6.77	0.157	0.06	148.0
The period						3673.6

WILLOW CREEK NEAR MACLEOD.

This station was established July 1, 1909, by H. C. Ritchie. It is located at the traffic bridge on the S.W. ¼ Sec. 25, Tp. 9, Rge. 26, W. 4th Mer.
The gauge, which is a plain staff graduated to feet and hundredths, is fixed in a stilling box about 300 yards upstream from the bridge and near Mr. McLean's stable. It is referred to a bench-mark on a post 150 feet north of the gauge; elevation, 8. 41.

The channel is straight for about 600 feet above and below the station. The right bank is high and wooded. The left bank is low, wooded, and liable to overflow in high-water stages. The bed of the stream is of clean gravel. The slope is uniform and the current swift.

Discharge measurements are made from the bridge during high stages, the initial point for soundings being marked on the down-stream hand-rail on a line with the face of the north abutment. During low stages the river is waded at the same section and when very low, at the gauge.

During 1911, the gauge was read daily by Jas. R. McLean.

DISCHARGE MEASUREMENTS of Willow Creek near Macleod, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Apr. 13.	J. E. Degnan.....	64.0	104.21	1.092	2 12	113 88
May 2	do	61.0	96.30	1.067	2 05	102 77
May 26	A. W. P. Lowrie.....	98.5	166.45	1.900	2 70	314 77
June 12	do	80.6	134.21	1.550	2 45	209 05
July 4	do	75.8	121.92	1.230	2 30	150 59
July 20	do	55.0	78.75	0.800	1 89	63 39
Aug. 5	do	68.0	100.9	1.180	2 11	119 53
Aug. 28	do	98.6	149.59	1.630	2 40	243 21
Sept. 19	do	105.2	221.10	2.220	3 06	490 67
Oct. 19	N. M. Sutherland.....	76.0	116 9	1.440	2 34	168 65

DAILY GAUGE-HEIGHT AND DISCHARGE of Willow Creek near Macleod, Alta., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.			1 70	48 0	1 95	81 11	3 00	460
2.			1 60	37 0	1 87	69 1	2 95	434
3.			1 55	33 5	1 85	66 5	2 95	434
4.			1 65	42 5	1 83	63 9	2 85	385
5.			1 70	48 6	1 84	65 2	2 75	338
6.			1 65	42 5	1 83	63 9	2 66	297
7.			1 60	37 0	1 84	65 2	2 60	269
8.			1 90	73 0	1 87	69 1	2 53	246
9.			1 97	84 2	1 90	73 1	2 50	228
10.			2 01	90 9	1 87	69 1	2 45	209
11.			2 00	89 5	1 85	66 5	2 38	184
12.			2 10	108 0	1 84	65 2	2 30	158
13.			1 96	82 6	1 92	76 2	2 28	153
14.			1 90	73 0	2 00	89 0	2 40	190
15.			1 86	67 8	2 20	131 0	2 25	144
16.			1 86	67 8	2 24	142 0	2 22	136
17.			1 85	66 5	3 10	513 0	2 20	131
18.			1 84	65 2	3 70	881 0	2 13	115
19.			1 87	69 1	2 90	409 0	2 08	104
20.			1 85	66 5	2 90	409 0	2 04	96 6
21.			1 82	62 6	2 70	315 0	2 04	96 6
22.	2.65	292	1 96	82 6	2 50	228 0	2 02	92 8
23.	2.65	292	2 01	90 9	2 55	248 0	2 02	92 8
24.	2.60	269	2 05	98 5	2 56	253 0	2 20	131
25.	2.55	248	2 07	102 3	2 58	261 0	2 20	131
26.	2.40	190	2 10	108 0	2 58	261 0	2 25	144
27.	2.40	190	2 17	124 0	2 55	248 0	2 25	144
28.	2.25	144	2 20	131 0	2 66	297 0	2 23	139
29.	2.00	89 0	2 12	113 0	2 66	297 0	2 25	144
30.	1.90	73.0	2 06	100 0	2 66	297 0	2 26	147
31.	1.80	65.0			2 80	361 0		

DAILY GAUGE-HEIGHT AND DISCHARGE of Willow Creek near Macleod, Alta., for 1911.—*Con.*

DAY.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge	Gauge Height	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge	Gauge Height	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2 25	144	1 70	48.0	2 16	122	2 56	253	1 95	81.0
2	2.25	144	1 75	54 0	2 15	120	2 53	240	1 96	82.6
3	2.23	139	1 85	66.5	2 12	113	2 50	228	2 04	96 6
4	2.20	131	1 90	73.0	2 35	174	2 50	228	2 05	98.5
5	2.15	120	1 96	82.6	4 60	148	2 45	209	2 20	131.
6	2.10	108	2 25	144	4 50	1413	2 40	190	2 20	131.
7	2.05	98 5	2 45	209	4 50	1413	2 35	174	2 23	139.
8	1.95	81 0	3 10	513	4 15	1178	2 30	158	2 25	144.
9	1.95	81 0	4 35	1312	4 05	1114	2 30	158	2 25	144.
10	1.94	79 4	4 00	1078	3 92	1024	2 30	158	2 27	150.
11	1.93	77 8	3 70	881	3 75	914	2 27	150	2 30	158.
12	1.87	69 1	3 40	689	3 65	848	2 27	150	2 33	168.
13	1.84	65 2	3 10	513	3 44	714	2 25	144	2 35	174
14	1.82	62 6	2 90	409	3 20	570	2 23	139	2 35	174.
15	1.78	57 6	2 70	315	3 10	513	2 20	131	2 35	174.
16	1.75	54 0	2 70	315	3 00	460	2 18	126		
17	1.72	50 4	2 85	385	3 00	460	2 16	122		
18	1.74	52 8	2 70	315	2 90	409	2 14	117		
19	1.75	54 0	2 55	248	2 83	375	2 10	108		
20	1.74	52 8	2 50	228	2 75	338	2 10	108		
21	1.74	52 8	2 45	209	2 73	329	2 10	108		
22	1.73	51 6	2 40	190	2 70	315	2 10	108		
23	1.72	50 4	2 35	174	2 75	338	2 08	104		
24	1.72	50 4	2 30	158	2 72	324	2 08	104		
25	1.70	48 0	2 25	144	2 70	315	2 05	98.5		
26	1.70	48 0	2 23	139	2 67	301	2 03	94.7		
27	1.68	45 8	2 20	131	2 65	292	1 70	48 0		
28	1.67	44 7	2 26	147	2 63	283	1 75	54.0		
29	1.65	42 5	2 24	142	2 60	269	1 80	60 0		
30	1.68	45 8	2 20	131	2 56	253	1 90	73 0		
31	1.68	45 8	2 18	126			1 95	81.0		

MONTHLY DISCHARGE of Willow Creek near Macleod, Alta., for 1911.

(Drainage area, 1005 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile	Depth in inches on Drainage area.	Total in acre-feet.
March (22-31).....	292	65	185	.184	.07	3,669
April.....	131	33.5	76.9	.076	.08	4,576
May	881	63.9	211	.209	.24	12,974
June.....	460	92.8	199	.198	.22	11,841
July.....	144	42.5	72.5	.072	.08	4,458
August.....	1,312	48	309	.305	.35	1,900
September.....	1,413	113	515	.512	.57	30,645
October	253	48	136	.135	.16	8,362
November (1-15).....	174	81	136	.135	.08	4,047
The period.....						82,472

OLDMAN RIVER NEAR MACLEOD, ALTA.

This station was established on July 12, 1910, by H. C. Ritchie. It is located at the traffic bridge on the N.W. ¼ Sec. 10, Tp. 9, Rge. 26, W. 4th Mer.
The gauge is a plain staff graduated to feet and hundredths, fastened to a crib protecting the pier near the right bank. It is referred to a bench-mark on spikes in a wooden bent, 93 feet east of the gauge; elevation, 11.96.

The channel is straight for 400 feet above and 1000 feet below the station. Both banks are low, wooded and liable to overflow in extreme high water. The bed is composed of clean gravel, and shifts during high-water stages. The current is swift, especially during high water.

Discharge measurements are made from the bridge, the initial point for soundings being at the left end of the hand-rail on the downstream side.

During 1911 the gauge was read by Mrs. Walter Jackson. The tables of daily and monthly discharge for 1911 have not yet been prepared, but will be compiled during 1912, and published with the records for that year.

DISCHARGE MEASUREMENTS of Oldman River, near Macleod, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 4	J. E. Degnan	273.5	819.36	3.087	5.56	3,119.37
May 15	do	80.0	252.80	2.251	3.19	5,960.50
May 26	A. W. Lowrie	293.0	1,041.57	4.890	5.94	5,096.96
June 13	do	402.0	1,715.89	5.690	7.60	9,769.70
July 3	do	260.0	768.11	4.330	5.34	3,325.86
July 19	do	180.0	401.75	4.140	4.15	1,665.03
Aug. 5	do	106.6	395.10	4.060	4.10	1,603.42
Aug. 28	do	104.5	363.63	3.620	3.85	1,314.70
Sept. 19	N. M. Sutherland	117.5	492.53	5.460	5.01	2,689.86
Oct. 18	do	102.0	357.10	3.190	3.77	1,140.86
Dec. 11	do	102.0	322.70	1.780	3.54	573.65

MEAN DAILY GAUGE-HEIGHT, in feet, of Oldman River near Macleod, Alta., for 1911.

DAY.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
1		3.55	5.25	8.25	5.45	3.85	3.53	4.56	3.20	3.55
2		3.52	5.22	8.35	5.42	3.89	3.50	4.40	3.20	4.07
3		3.50	5.22	8.55	5.45	3.89	3.46	4.37	3.20	4.10
4		3.42	5.45	8.35	5.32	3.89	4.92	4.32	3.20	4.15
5		3.36	5.80	8.20	5.25	4.08	7.60	4.29	3.20	4.13
6		3.30	6.45	8.16	5.15	4.19	7.50	4.25	3.22	4.10
7		3.25	6.35	7.88	5.04	4.25	7.35	4.20	3.25	4.07
8		3.20	6.15	7.85	4.15	5.25	6.89	4.15	3.25	4.02
9		3.20	5.75	7.80	4.35	6.55	6.70	4.10	3.25	3.95
10		3.30	5.65	7.16	4.55	6.20	6.55	4.05	3.25	3.85
11		3.40	5.50	7.25	4.45	5.67	6.50	4.01	3.25	3.77
12		3.30	5.55	7.53	4.37	5.35	6.45	3.95	3.25	3.70
13		3.25	5.65	7.80	4.30	5.15	6.28	3.95	3.25	3.60
14		3.20	5.80	7.90	4.20	4.87	5.90	3.90	3.25	3.59
15		3.19	7.20	7.65	4.20	4.75	5.75	3.87	4.75	3.56
16		3.17	9.40	7.35	4.20	4.53	5.65	3.80	4.85	3.51
17		3.25	8.75	7.20	4.19	4.45	5.50	3.77	5.15	3.45
18		3.50	7.69	7.02	4.19	4.36	5.30	3.75	5.36	3.39
19		3.90	7.02	6.65	4.15	4.29	5.04	3.69	4.50	3.35
20		4.25	6.10	6.32	4.13	4.25	5.01	3.64	4.42	3.35
21		4.60	6.40	6.14	4.10	4.12	4.99	3.59	4.35	3.55
22	3.69	4.80	6.37	6.12	4.08	4.05	4.97	3.55	4.29	3.80
23	3.67	5.20	6.32	6.12	4.06	4.01	4.95	3.51	4.19	4.20
24	3.65	5.40	6.23	6.30	4.03	3.95	4.90	3.48	4.15	4.29
25	3.60	5.41	6.10	6.80	4.00	3.87	4.79	3.45	4.10	4.21
26	3.58	5.85	5.85	6.45	3.95	3.80	4.70	3.40	4.05	4.21
27	3.55	6.05	5.80	6.20	3.85	3.89	4.62	3.36	4.03	4.50
28	3.50	5.60	5.91	5.12	3.83	3.85	4.58	3.25	3.92	4.70
29	3.48	5.35	6.10	5.25	3.82	3.79	4.55	3.22	3.79	4.89
30	3.65	5.30	6.55	5.40	3.80	3.69	4.51	3.20	3.55	5.10
31	3.61		7.17		3.82	3.58		3.20		5.20

PINCHER CREEK AT PINCHER CREEK.

Under the direction of Arthur O. Wheeler, a regular gauging station was established on Pincher Creek at Pincher Creek, in the spring of 1898. On August 13, 1906, J. F. Hamilton replaced the old gauge by a new one. Owing to local improvements the gauge has since been changed, but the station remains in practically the same place as established by Mr. Wheeler.

The gauge is a plain staff graduated to feet and hundredths, securely fastened to the break-water on the right bank, about twenty feet below the traffic bridge. It is referred to benchmarks on the north abutment and a low pile underneath the north end of the bridge (elevations 7.75 and 3.40 feet, respectively, above the zero of the gauge). It is read by P. Bertles, who lives on the north side of the creek.

During high water, discharge measurements are made from the downstream side of the bridge. At low stages, the creek is waded 450 yards upstream.

The channel is straight for about 200 yards above and 300 yards below the bridge. Both banks are high, the right being well cribbed; neither is liable to overflow. The bed is rock and free from vegetation. At the wading section, the channel is straight for about 500 yards above and 70 yards below. Both banks are high, clean and not liable to overflow. The bed is gravel, mixed with heavy gumbo clay.

The town of Pincher Creek has a gravity waterworks system which diverts water from the creek at a point about three and one quarter miles above the bridge and the records at this station do not include the water used by the town.

The tables of daily and monthly discharge for 1911 have not yet been prepared, but will be compiled during 1912, and published with the records for that year.

DISCHARGE MEASUREMENTS of Pincher Creek, at Pincher Creek, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
Apr. 22.....	J. E. Degnan.....	35.50	30.93	2.641	2.15	81.69*
May 12.....	A. W. P. Lowrie.....	34.50	24.85	2.320	2.02	57.70††
June 3.....	do.....	45.40	88.86	3.970	3.00	352.90†
June 3.....	do.....	76.00	77.30	4.310	3.00	333.30x
June 20.....	do.....	40.70	37.23	2.420	2.49	90.32
July 11.....	do.....	36.16	21.53	1.820	2.17	39.29
July 27.....	do.....	13.80	13.27	1.430	2.00	19.07
Aug. 19.....	do.....	39.00	24.42	1.610	2.24	39.40
Sept. 2.....	do.....	19.00	14.66	1.860	2.10	27.13
Sept. 7.....	do.....	81.00	116.05	4.720	3.65	547.77
Oct. 10.....		34.20	40.22	1.700	2.67	68.31
Oct. 30.....	do.....	33.00	35.35	1.300	2.55	45.79†

* 3 point method.
†† At foot bridge near regular station.
x Gauged at highway bridge.
† Gauged 75' ft. below footbridge.

MEAN DAILY GAUGE-HEIGHT, in feet, of Pincher Creek, at Pincher Creek, Alta., for 1911.

DAY.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.
1.		1.78	2 03	3 00	2 70	2 07	2 15	2.90	2 49
2.		1.69	1 98	3 18	2 67	2 15	2 10	2.95	2 47
3.		1.65	2 02	3 02	2 65	2 10	2 10	3.00	2 47
4.		1.91	2 05	3 00	2 60	2 06	4 60	3.00	2 45
5.		1.90	2 04	2 87	2 54	2 02	4 00	2.98	2 45
6.		1.85	2 08	2 82	2 50	2 30	4 00	2.94	2 44
7.		1.87	2 10	2 80	2 46	3 85	3 90	2.91	2 45
8.		1.85	2 10	2 89	2 42	2 25	3 73	2.90	2 45
9.		1.83	2 09	2 90	2 38	2 20	3 64	2.90	2 47
10.		2.02	2 00	2 92	2 35	2 12	3 60	2.88	2 47
11.		2.05	1 97	2 90	2 30	2 03	3 50	2.84	2 50
12.		1.93	1 97	2 90	2 24	1 97	3 34	2.81	2 50
13.		1.90	2 38	2 95	2 20	2 70	3 27	2.76	2 48
14.		1.81	2 22	2 96	2 17	2 50	3 30	2.70	2 48
15.		1.75	3 55	2 91	2 12	2 57	3 17	2.70	2 50
16.		1.77	3 60	2 88	2 10	2 60	3 10	2.74	
17.		1.77	3 37	2 80	2 10	2 56	3 05	2.71	
18.		1.90	2 84	2 76	2 08	2 54	3 00	2.69	
19.	2 12	1.90	2 81	2 75	2 08	2 51	3 00	2.69	
20.	2.04	1.85	2 80	2 70	2 05	2 50	2 95	2.68	
21.	1.94	1.90	2 78	2 67	2 00	2 44	3 00	2.68	
22.	1.90	2.02	3 02	2 60	2 06	2 40	3 00	2.68	
23.	1.86	2.30	2 80	2 54	2 06	2 35	3 00	2.66	
24.	1.80	1.97	2 75	3 62	2 00	2 30	3 00	2.56	
25.	1.82	1.97	2 70	3 18	2 00	2 22	3 00	2.52	
26.	1.80	1.97	2 77	2 88	2 03	2 20	3 00	2.52	
27.	1.76	1.96	3 00	2 80	2 00	2 20	2 97	2.54	
28.	1.81	1.96	3 05	2 77	2 00	2 22	2 97	2.54	
29.	1.89	1.95	3 02	2 74	2 03	2 20	2 94	2.53	
30.	2 00	1.95	2 97	2 64	2 04	2 20	2 90	2.50	
31.	1 80		3 06		2 02	2 17		2.50	

SOUTHFORK RIVER NEAR COWLEY.

This gauging station, located at the traffic bridge between Cowley and Pincher on the S.E. ¼ Sec. 2, Tp. 7, Rge. 1, W. 5th Mer., was established by H. C. Ritchie on August 5, 1909.

The gauge is a plain staff, graduated to feet and hundredths. It was first fastened to the second pier of the bridge from the left bank, but, owing to this section changing during floods, was moved to a point about half a mile downstream and securely fastened by braces to supports on the bank. In its present position it is about five minutes walk from the house of Mr. G. W. Buchanan, who reads it daily. It is referenced by a bench-mark on a tree within twenty feet; elevation 8.33.

Above the bridge an island divides the river into two channels, this island being submerged during high-water stages. These two channels join about fifty feet upstream from section, but the stream is again divided into three by the piers of the bridge. Owing to the protection of the piers, gravel-bars are formed downstream from the section.

The bed of the river is quite rough, requiring extreme care in determining the area of the section. The current is swift, except through the east channel during low stages, when it becomes very sluggish.

Discharge measurements are made from the downstream side of the bridge during both high and low water, the initial point for sounding being marked on the superstructure in line with the face of the abutment on the left bank.

The tables of daily and monthly discharge for 1911 have not yet been prepared, but will be compiled during 1912 and published with the records for that year.

SESSIONAL PAPER No. 25d

DISCHARGE MEASUREMENTS of Southfork River, near Cowley, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Feb. 20.....	W. H. Green.....	77 0	88 00	1.010	3 33	89.16
Feb. 27.....	do		358 65	0.610	3 51	219.71
Mar. 21.....	J. E. Degnan.....	78 0	157 75	1.353	2 95	212.78
Apr. 7.....	do	81 0	161 13	1.190	2 28	191.77
Apr. 27.....	do	205 0	415 14	3.818	3 70	1,584.82
June 5.....	do	248 0	738 10	5.910	5 10	4,367.76
June 21.....	A. W. P. Lowrie.....	221 8	530 60	4.890	4 15	2,640.76
July 12.....	do	181 0	299 35	3.220	3 09	964.94
July 28.....	do	100 0	222 05	2.480	2 62	551.69
Aug. 21.....	do	108 2	242 58	2.370	2 74	575.49
Sept. 12.....	do	235 0	571 85	4.850	4 30	2,776.27
Oct. 11.....	N. M. Sutherland ..	109 0	234 69	2.390	2 76	561.33
Nov. 4.....	do	97 0	173 17	1.900	2 37	329.84
Nov. 30.....	do	40 0	111 50	2.010	3 45	224.68
Dec. 14.....	do	54 0	111 41	1.710	3 12.5	190.39

MEAN DAILY GAUGE-HEIGHT, in feet, of Southfork River near Cowley, Alta., for 1911.

DAY.	Jan.	Feb.	March	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
1.....	2 43	3 30	3 55	2 40	3 07	4 40	3 85	2 69	2 46	3 05	2 45	3.40
2.....	2 35	3 20	3 60	2 85	3 06	5 00	3 70	2 75	2 45	3 03	2 45	3.35
3.....	2 05	3 05	3 55	2 45	3 11	5 40	3 60	2 70	2 45	3 00	2 40	3.28
4.....	3 57	3 45	3 60	2 38	3 30	5 40	3 55	2 70	6 00	2 95	2 36	3.12
5.....	3 10	3 45	3 50	2 40	3 50	5 05	3 45	2 68	5 20	2 90	2 33	3.15
6.....	3 30	3 47	3 60	2 45	3 85	4 70	3 45	2 74	4 90	2 90	2 30	3.13
7.....	3 15	3 45	3 65	2 28	3 70	4 65	3 35	3 55	4 50	2 85	2 30	3.15
8.....	3 00	3 47	3 65	2 26	3 60	4 80	3 30	3 75	4 45	2 80	5 15	3.15
9.....	2 87	3 45	3 65	2 30	3 45	4 70	3 30	3 65	4 50	2 80	5 10	3.10
10.....	2 70	3 45	3 58	2 34	3 35	4 80	3 20	3 55	4 30	2 83	5 10	2.97
11.....	2 83	3 45	3 50	2 35	3 30	5 00	3 10	3 45	4 30	2 85	4 20	2.60
12.....	3 25	3 45	3 50	2 35	3 25	5 30	3 90	3 25	4 30	2 80	4 20	3.17
13.....	3 35	3 45	3 55	2 28	3 40	5 40	3.05	3 00	4 20	2 75	4 25	3.20
14.....	3 40	3 47	3 43	2 25	3 40	5 30	3 05	3 15	4 15	2 70	3 80	3.05
15.....	3 40	3 45	3 52	2 25	3 40	5 30	3 05	3 05	3 95	2 67	4 20	3.08
16.....	3 40	3 45	3 45	2 35	5 25	5 10	3 08	2 94	3 70	2 65	4 30	3.10
17.....	3 35	3 56	3 45	2 52	4 50	4 95	3 03	2 85	3 55	2 65	4 25	3.05
18.....	3 30	3 50	3 38	2 55	4 30	4 70	3 00	2 80	3 50	2 63	4 30	3.20
19.....	3 25	3 45	3 25	2 68	4 10	4 50	2 95	2 75	3 40	2 60	4 10	3.00
20.....	3 13	3 26	3 10	2 86	3 90	4 35	2 90	2 70	3 30	2 60	3 90	3.50
21.....	3 30	3 50	2 87	3 10	3 60	4 15	2 80	2 74	3 30	2 55	3 80	3.50
22.....	3 25	3 45	2 75	3 15	3 60	4 15	2 75	2 70	3 25	2 50	3 65	3.50
23.....	3 10	3 55	2 67	3 30	3 55	4 10	2 80	2 64	3 25	2 40	3 50	3.40
24.....	3 20	3 49	2 55	3 40	3 40	4 50	2 70	2 60	3 25	2 40	3 55	3.45
25.....	3 30	3 55	2 45	3 70	3 30	4 85	2 68	2 60	3 25	2 42	3 50	3.40
26.....	3 25	3 50	2 35	3 30	3 20	4 50	2 65	2 60	3 25	2 42	3 40	3.37
27.....	3 20	3 44	2 38	3 30	3 20	4 25	2 60	2 65	3 22	2 45	3 30	3.20
28.....	3 35	3 45	2 40	3 20	3 20	4 10	2 62	2 55	3 22	2 44	3 25	3.18
29.....	3 35		2 40	3 07	3 30	3 95	2 55	2 50	3 10	2 42	3 33	3.20
30.....	3 30		2 40	3 03	3 80	3 90	2 70	2 50	3 05	2 43	3 50	3.15
31.....	3 30		2 38		4 10		2 65	2 48		2 44		3.10

MILL CREEK NEAR MOUNTAIN MILL.

This gauging station, located on the S.W. ¼ Sec. 18, Tp. 6, Rge. 1, W. 5th Mer., at the abandoned site of the old Government mill nine and a half miles west of Pincher Creek post office, was established July 7, 1910, by H. C. Ritchie.

The gauge is a plain staff graduated to feet and hundredths, placed at the left bank. It is referred to a bench-mark on a spike at the northeast corner of the mill (elevation 10.97).

The channel is straight for 200 feet above and 300 feet below the station. Both banks are high, clean, rocky and will not overflow. The bed of the stream is of gravel, giving a stable cross-section. The current is swift.

Discharge measurements in flood stages are made from the bridge. In normal and low-water stages the creek is waded fifty feet upstream from the gauge, the initial point for soundings being a stake on the left bank.

During 1911, the gauge was read by Mrs. J. Mellquham. The tables of daily and monthly discharge for 1911 have not yet been prepared, but will be compiled during 1912 and published with the records for that year.

DISCHARGE MEASUREMENTS of Mill Creek near Mountain Mill, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 21.....	J. E. Degnan.....	49.0	42.37	3.211	2.57	136.05*
May 11.....	A. W. P. Lowrie.....	45.5	64.36	2.380	2.66	153.32*
June 28.....	do.....	65.5	105.17	3.260	2.75	342.74†
July 10.....	do.....	46.8	40.01	2.520	2.25	100.98
July 26.....	do.....	36.7	27.95	1.920	2.01	53.66*
Aug. 18.....	do.....	48.0	36.92	2.730	2.30	100.85*
Sept. 13.....	do.....	68.6	137.29	4.670	3.30	641.80†
Oct. 9.....	N. M. Sutherland.....	40.0	36.25	2.670	2.07	96.71
Nov. 1.....	do.....	35.5	32.76	2.040	1.96	66.78-

* 3 point method.
† Gauged at bridge.
- Slush Ice.

MEAN DAILY GAUGE-HEIGHT, in feet, of Mill Creek, at Mountain Mill, Alta., for 1911.

DAY.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.
1.....	2.20	2.58	3.60	2.75	2.50	2.02	2.25	2.05
2.....	2.20	2.60	3.65	2.67	3.05	2.02	2.30	2.00
3.....	2.18	2.60	3.60	2.65	2.85	2.40	2.25	1.95
4.....	2.10	2.65	3.40	2.65	2.60	4.60	2.20	1.95
5.....	2.20	2.70	3.00	2.50	2.20	3.70	2.20	1.95
6.....	2.10	3.00	3.00	2.40	2.30	2.80	2.15	1.95
7.....	2.18	3.05	3.00	2.40	3.27	2.90	2.15	2.00
8.....	2.18	2.85	3.05	2.40	3.20	3.40	2.10	2.05
9.....	2.20	2.85	3.10	2.35	3.05	3.40	2.10	2.10
10.....	2.20	2.75	3.10	2.30	3.05	3.30	2.10	2.30
11.....	2.20	2.70	3.40	2.30	2.70	3.39	2.10	2.35
12.....	2.18	2.70	3.22	2.20	2.60	3.35	2.10	2.50
13.....	2.30	2.86	3.15	2.20	2.50	3.30	2.10	2.95
14.....	2.20	2.80	3.15	2.15	2.45	3.20	2.05	3.10
15.....	2.35	3.00	3.10	2.10	2.40	3.15	2.05	3.30
16.....	2.30	4.15	3.10	2.10	2.38	3.10	2.05	.....
17.....	2.35	3.50	2.95	2.10	2.38	2.80	2.05	.....
18.....	2.37	3.31	2.95	2.10	2.30	2.70	2.10	.....
19.....	2.45	3.15	2.90	2.18	2.22	2.60	2.05	.....
20.....	2.58	3.10	2.00	2.16	2.19	2.49	2.05	.....
21.....	2.80	3.10	2.00	2.16	2.22	2.49	2.00	.....
22.....	2.70	3.50	2.10	2.10	2.18	2.50	2.00	.....
23.....	2.65	3.00	2.10	2.15	2.18	2.50	1.95	.....
24.....	2.80	2.82	2.20	2.12	2.16	2.50	1.95	.....
25.....	2.85	2.80	2.20	2.12	2.20	2.50	1.95	.....
26.....	2.82	2.75	2.40	2.01	2.20	2.30	2.00	.....
27.....	2.70	2.65	2.40	2.02	2.20	2.30	2.00	.....
28.....	2.60	2.65	2.60	2.05	2.10	2.30	2.00	.....
29.....	2.63	2.75	2.80	2.05	2.00	2.30	2.00	.....
30.....	2.58	3.40	2.80	2.20	2.00	2.20	2.00	.....
31.....		3.44	.....	2.30	2.00	.....	2.05	.....

CANYON CREEK NEAR MOUNTAIN MILL.

This gauging station, located on the N.E. ¼ Sec. 14, Tp. 6, Rge. 2, W. 5th Mer. near G. Biron's ranche, was established July 6, 1910, by H. C. Ritchie.

The gauge is a plain staff graduated to feet and hundredths, placed at the left bank within 75 feet of Mr. Biron's corral. It is referred to a bench-mark on a spike in a tree within fifteen feet; elevation 14.49.

The channel is straight for 150 feet above and 30 feet below the station. Both banks are high, wooded and will not overflow. The bed of the stream is as clean gravel and rock. The current is very swift and turbulent. On this account discharge measurements are made about half a mile upstream at the traffic bridge on the road allowance to the Beaver coal mines.

SESSIONAL PAPER No. 25d

Discharge measurements are made from the bridge during high-water stages, the initial point for soundings being on a line with the face of the left abutment. At ordinary stages the stream is waded about 100 yards downstream, the initial point for soundings being marked by a hub on the left bank.

During 1911, the gauge was read by Mr. G. Biron. The tables of daily and monthly discharge for 1911 have not yet been prepared, but will be compiled during 1912 and published with the records for that year.

DISCHARGE MEASUREMENTS of Canyon Creek, near Mountain Mill, in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 21.....	J. E. Degnan.....	18.0	28.59	1.913	5.27	54.68
May 11.....	A. W. P. Lowrie.....	18.5	19.78	1.88	4.98	37.28
June 28.....	do.....	18.20	16.52	1.88	4.92	30.08
July 10.....	do.....	17.50	10.20	1.07	4.55	10.98
July 26.....	do.....	17.00	8.09	0.93	4.37	7.59
Aug. 18.....	do.....	17.80	8.94	1.00	4.50	8.93
Sept. 13.....	do.....	18.4	33.59	2.78	5.50	93.51
Oct. 9.....	N. M. Sutherland.....	18.8	14.87	1.70	4.85	25.22
Nov. 1.....	do.....	18.0	13.89	1.12	4.72	15.60

MEAN DAILY GAUGE-HEIGHT, in feet, of Canyon Creek near Mountain Mill, for 1911.

DAY.	April.	May.	June.	July.	August	Sept.	Oct.	Nov.
1.....		5.14	5.90	4.83	4.40	4.39	4.94	4.70
2.....		5.14	5.75	4.78	4.54	4.40	4.94	4.67
3.....		5.12	5.60	4.74	4.53	4.49	4.95	4.61
4.....		5.19	5.40	4.72	4.46	6.05	4.91	4.61
5.....		5.20	5.33	4.68	4.46	6.40	4.91	4.60
6.....		5.23	5.30	4.66	4.45	6.10	4.86	4.58
7.....		5.20	5.35	4.62	5.00	6.20	4.85	4.60
8.....		5.10	5.25	4.60	5.14	6.25	4.84	4.95
9.....		5.04	5.20	4.58	5.02	6.15	4.83	5.72
10.....	4.54	5.01	5.15	4.57	4.94	5.80	4.82	5.92*
11.....	4.60	4.96	5.15	4.54	4.82	5.78	4.78	5.92*
12.....	4.61	4.95	5.10	4.54	4.73	5.60	4.77	5.92*
13.....	4.63	5.15	5.05	4.52	4.64	5.50	4.77	5.92*
14.....	4.54	5.24	5.10	4.51	4.60	5.40	4.76	5.92*
15.....	4.55	5.58	5.03	4.49	4.56	5.34	4.75	5.92*
16.....	4.64	6.90	5.00	4.46	4.55	5.30	4.74	
17.....	4.80	6.20	4.94	4.45	4.52	5.20	4.73	
18.....	4.94	5.90	4.90	4.44	4.50	5.15	4.72	
19.....	5.02	5.60	4.80	4.46	4.49	5.12	4.71	
20.....	5.10	5.50	4.79	4.45	4.45	5.10	4.70	
21.....	5.30	5.40	4.80	4.43	4.48	5.05	4.69	
22.....	5.45	5.34	4.80	4.43	4.48	5.10	4.69	
23.....	5.59	5.39	4.74	4.42	4.47	5.07	4.68	
24.....	5.35	5.34	4.80	4.44	4.43	5.14	4.70	
25.....	5.50	5.30	5.45	4.43	4.40	5.12	4.70	
26.....	5.51	5.30	5.10	4.35	4.43	5.10	4.72	
27.....	5.40	5.40	5.00	4.32	4.50	5.05	4.73	
28.....	5.24	5.60	4.94	4.32	4.45	5.00	4.74	
29.....	5.24	5.80	4.85	4.34	4.41	5.00	4.63	
30.....	5.20	6.08	4.84	4.47	4.40	4.97	4.63	
31.....		6.10		4.38	4.33		4.65	

* Top of ice.

OLDMAN RIVER NEAR COWLEY.

This gauging station, located at a ford on the N.W. ¼ Sec. 34, Tp. 7, Rge. 1, W. 5th Mer., and approximately four miles northeast of Cowley, was established by H. C. Ritchie, on Sept. 15, 1908.

The gauge is a plain staff graduated to feet and hundredths. It is securely fastened to a post on the right bank and is connected with the channel by a ditch. It is referenced by two bench-marks, the first on a tree 20 feet upstream (elevation 9.63); the second on a stone 15 feet downstream (elevation 3.32).

The discharge measurements are made at the gauge, where a cable station has been erected for use during high-water stages. During low water the river is waded at the same section. The points for soundings are permanently marked by a tagged wire, stretched directly above the cable.

The channel is straight for about 900 feet above and 250 feet below the section. The bed is of rock and gravel and is free from vegetation. The current has considerable velocity, but flows smoothly to about 150 feet below the section, where it breaks into small rapids. Both banks are high and wooded, neither being liable to overflow.

During 1911, the gauge was read by Mr. Hugh W. Pettit. The tables of daily and monthly discharge for 1911 have not yet been prepared, but will be compiled during 1912 and published with the records for that year.

DISCHARGE MEASUREMENTS of Oldman River, near Cowley, in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 21.....	W. H. Green.....	158	116 7	0 993	2 46	116.82
Feb. 16.....	do	140	74 95	1 14	2 95	85.80
Feb. 28.....	do	140	79 25	1 22	2 91	96.54
Mar. 20.....	do	159	159 82	1 46	2 60	234.02
April 6.....	J. E. Degnan.....	36	113 70	1 186	1 03	134.87
Apr. 26.....	do	194	335 05	3 514	2 26	1,177.24
May 18.....	A. W. P. Lowrie. .	200	459 0	4 99	3 02	2,290.77
June 6.....	do	197.0	439 66	4 80	2 95	2,108.08
June 23.....	do	188.0	360 91	4 50	2 55	1,623.58
July 13.....	do	187.0	238 33	2 72	1 85	649.19
July 29.....	do	180.0	176 05	1 67	1 55	294.33
Aug. 22.....	do	188.0	232 95	2 34	1 85	545.18
Sept. 9.....	do	199.0	381 5	4 15	2 65	1,575.57
Oct. 12.....	N. M. Sutherland. .	180.0	191 85	2 21	1 64	423.19
Nov. 2.....	do	140.0	133 65	1 61	1 28	215.03*
Nov. 29.....	do	143.0	130 54	1 26	2 30	164.74
Dec. 15.....	do	183.0	125 25	1 25	2 21	156.12

* Slush Ice.

TODD CREEK AT ELTON'S RANCHE.

This station was established by H. C. Ritchie on August 3, 1909. It is located seven miles northwest of Cowley, at a private foot-bridge about twenty feet from Cecil Elton's house on the S.W. ¼ Sec. 19, Tp. 8, Rge. 1, W. 5th Mer.

The gauge is a plain staff graduated to feet and hundredths, driven into the bed of the stream and securely braced to the left bank. It is referred to the top of a stake about ten feet east (elevation 6.70 above the zero of the gauge). It is read by Cecil Elton.

The channel is straight for about 55 feet above and 60 feet below the gauge. The right bank is high and wooded and liable to overflow in extreme high water. The left bank is wooded and liable to overflow for about five feet from edge, where it rises abruptly to about six feet. The bed lies in one channel and is composed of clean sand and gravel. The current is inclined to be swift at high stages, but quite sluggish at low.

Cecil Elton and Capt. Cardwell have irrigation ditches which divert water at points above this gauging station. Mr. Elton irrigates about 35 acres, and Capt. Cardwell about 90. Very little, if any, water was diverted during 1911.

The tables of daily and monthly discharge for 1911 have not yet been prepared, but will be compiled during 1912 and published with the records for that year.

SESSIONAL PAPER No. 25d

DISCHARGE MEASUREMENTS at regular stations of Todd Creek at Elton's Ranche, in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Apr. 8.....	J. E. Degnan.....	8.5	4 42	1.063	2.77	4.70
April 24.....	do.....	18.5	19.87	1.734	3.15	34.47
May 17.....	A. W. P. Lowrie.....	19.7	48 88	3.16	4.25	156.37
June 8.....	do.....	19.30	32.80	1.92	3.39	63.10
June 26.....	do.....	20.0	22.78	1.23	3.05	28.09
July 14.....	do.....	20 4	17.68	1 49	2.75	11.90
July 31.....	do.....	19.7	17.79	0.77	2.81	13.65
Aug. 23.....	do.....	19 70	17 49	0.67	2.75	11.76
Sept. 8.....	do.....	20.00	23 46	1.38	3.07	32.36
Oct. 13.....	N. M. Sutherland.....	21.20	21.09	.75	2.83	15.78

MEAN DAILY GAUGE-HEIGHT, in feet, of Todd Creek at Elton's Ranche, for 1911.

DAY.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.
1.....		4.21	2 99	3 46	3 06	2 78	2 69	2.90	2.75
2.....		3.28	2 98	3 48	2 94	2 76	2 69	2.90	2 76
3.....		3.22	2 95	3 45	2 91	2 80	2 72	2.88	2.86
4.....		3.21	2 98	3 42	2 89	2 84	3 03	2.88	2.86
5.....		3.05	3 01	3 43	2 88	2 86	3 21	2.88	2.86 *
6.....		2.92	3 00	3 44	2 86	2 94	3 21	2.88	2.78 *
7.....		2 72	2 98	3 41	2 82	3 18	3 27	2.87	2.74 *
8.....		2.73	2 96	3 39	2 81	3 52	3 07	2.83	2.74 *
9.....		3.75	2 95	3 37	2 80	3 23	2 98	2.82	
10.....		3.42	2 96	3 30	2 80	3 14	2 90	2.81	
11.....		3.25	2 93	3 28	2 78	3 04	2 87	2.82	
12.....		3.20	2 93	3 23	2 78	2 93	2 84	2.82	
13.....		3.00	2 99	3 23	2 77	2 80	2 83	2.83	
14.....		2.87	3 38	3 22	2 74	2 80	2 91	2.81	
15.....		2.80	3 49	3 20	2 75	2 77	2 91	2.80	
16.....		2.82	3 82	3 18	2 76	2 77	2 93	2.80	
17.....		2.88	4 09	3 13	2 75	2 79	2 94	2.80	
18.....		2.91	3 75	3 11	2 78	2 77	2 93	2.80	
19.....		3.05	3 50	3 05	2 75	2 76	2 89	2.78	
20.....	7.35	3.07	3 44	3 04	2 76	2 75	2 90	2.78	
21.....	6.63	3.12	3 37	3 04	2 76	2 79	2 93	2.78	
22.....	6.50	3.14	3 32	3 03	2 77	2 76	2 89	2.79	
23.....	6.61	3.245	3 29	3 04	2 77	2 75	2 91	2.78	
24.....	6.22	3.14	3 34	3 04	2 76	2 73	2 95		
25.....	6.20	3.15	3 36	3 02	2 74	2 74	2 92	2.71	
26.....	5.21	3.17	3 38	3 01	2 72	2 76	2 93	2.80	
27.....	5.71	3.09	3 40	3 04	2 70	2 74	2 94	2.74	
28.....	5 36	3.01	3 57	2 95	2 70	2 75	2 93	2.78	
29.....	5.10	2 99	3 56	2 94	2 70	2 74	2 91	2 89	
30.....	4.68	2 99	3 54	3 04	2 80	2 75	2 90	2.84	
31.....	4.38		3 45		2 80	2 72		2.84	

*Creek frozen.

COW CREEK AT ROSS'S RANCHE.

A gauging station located on Sec. 12, Tp. 8, Rge. 2, W. 5th Mer., on Abel Brux's farm, was established August 2, 1909, by H. C. Ritchie. In the spring of 1910 Mr. Brux moved away, and, as no other observer was available, Mr. Ritchie established a new station, at John Ross's ranche on the N.E. ¼ Sec. 14, Tp. 8, Rge. 2, W. 5th Mer., on May 26, 1910.

The gauge is a plain staff graduated to feet and hundredths, placed at the right bank. It is referred to a bench-mark on the east side of the step at the door on the south side of John Ross's stable (elevation 13.71).

The channel is straight for 25 feet above and 40 feet below the station. Both banks are high, wooded and not liable to overflow. The bed is of clean sand and gravel.

Discharge measurements are made from a private bridge during high stages, the initial point for soundings being on the left bank. In low water the creek is waded.

During 1911, the gauge was read by Mr. John Ross. The tables of daily and monthly discharge for 1911 have not yet been prepared, but will be compiled during 1912 and published with the records for that year.

DISCHARGE MEASUREMENTS of Cow Creek, at Ross's Ranche, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 8	J. E. Degnan.	6.50	4 00	0.845	2.34	3.38
April 24	do	9 80	11 74	1.304	2.30	15.31
May 17	A. W. P. Lowrie...	10.00	18 70	2 520	3.05	47.11
June 8	do	9.00	13 43	1.790	2.50	24.11
June 26	do	9 00	9 42	1.040	2.05	9.77
July 14	do	9 00	6 75	0.550	1 80	3.73
July 31	do	9 20	7 32	0.580	1.85	4.24
Aug. 23	do	8.70	7 21	0.760	1.90	5.48
Sept. 8	do	9.00	10 19	1.320	2.23	13 49
Oct. 13	N. M. Sutherland	9.00	9 51	0.850	2.04	8 06

MEAN DAILY GAUGE-HEIGHT, in feet, of Cow Creek at Ross's Ranche, Alta., for 1911.

Day.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>
1		3 40	2 10	2 60	2 00	1.85	1 80	2 10	1 80
2		3 25	2 10	2 60	2 00	1.90	1 80	2 10	1.80
3		3 15	2 15	2 60	1 95	1 90	1 85	2 10	1 80
4		3 05	2 15	2 65	1.85	2 00	2 50	2 10	1 80
5		2 70	2 20	2 60	1.85	1 90	2 50	2 05	1.80
6		2 55	2 30	2 55	1 80	2 00	2 55	2 05	1.80
7		2 15	2 15	2 50	1 80	2 65	2 40	2 05	1 80
8		2 05	2 15	2 50	1 75	2 30	2 30	2 05	1.75
9		3 40	2 15	2 45	1 75	2 50	2 15	2 05	1.75
10		3 35	2 15	2 40	1 70	2 70	2 15	2 05	1 75
11		3 30	2 15	2 35	1 70	2 15	2 10	2 05	1.75
12		2 50	2 10	2 30	1 70	2 10	2 10	2 05	
13		2 07	2 35	2 30	1 70	2 00	2 10	2 05	
14		2 00	2 65	2 30	1 70	2 00	2 10	2 05	
15		1 95	2 70	2 30	1 70	2 00	2 05	2 05	
16		2 20	5 00	2 25	1 70	2 00	2 05	2 05	
17		2 15	3 15	2 20	1 70	2 00	2 05	2 05	
18		2 85	2 90	2 15	1 70	1 90	2 05	2 05	
19		2 85	2 80	2 10	1 70	1 90	2 05	2 05	
20		2 20	2 70	2 10	1 70	1 80	2 05	2 05	
21	5.55	2 60	2 65	2 10	1 70	1 90	2 05	1 95	
22	5.15	2 70	2 65	2 05	1 70	1 90	2 05	1 95	
23	4.85	2 50	2 60	2 05	1 70	1 85	2 15	1 90	
24	4.80	2 30	2 70	2 05	1 70	1 85	2 15	1 90	
25	4.75	2 50	2 75	2 05	1 70	1 85	2 20	1 90	
26	4.75	2 45	2 75	2 05	1 70	1 85	2 20	1 90	
27	4.70	2 30	2 85	2 05	1 70	1 85	2 20	1 90	
28	4.90	2 15	3 00	2 00	1 70	1 85	2 20	1 85	
29	5.25	2 15	2 85	2 00	1 70	1 80	2 15	1 85	
30	4.30	2 15	2 70	2 00	1 90	1 80	2 10	1 85	
31	3.60		2 60		1 90	1 80		1 85	

CONNELLY CREEK NEAR LUNDBRECK, ALTA.

This station was established July 31, 1909, by H. C. Ritchie. It is located at a foot-bridge on the trail in S.E. 1₄ Sec. 36, Tp. 7, Rge. 2, W. 5th Mer., and about 100 feet from the mouth of the creek.

This stream has a very crooked channel, and it is very difficult to find a suitable place for gauging. For about twenty feet below and above the gauge the channel is practically straight. The right bank is low and liable to overflow at high stages of the stream; the left bank is comparatively high. Both banks are thickly wooded near the water's edge. The bed is composed of sand and gravel, and is free from vegetation.

During high stages, discharge measurements are made from the foot-bridge, the initial point for soundings being a stake on the right bank. During low stages, the current at this point is too sluggish for accurate results, and a wading section about 200 feet upstream is used.

As Mr. N. V. Holway, who read the gauge in 1909, was not available, the gauge was not read during 1911.

SESSIONAL PAPER No. 25d

DISCHARGE MEASUREMENTS of Connelly Creek near Lundbreck, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 10.....	J. E. Degnan.....	11.20	7.54	0.671	2.60	5.06
April 24.....	do.....	12.50	9.10	1.255	2.70	11.42
May 17.....	A. W. P. Lowrie....	13.15	11.70	2.401	3.22	28.10
July 14.....	do.....	11.70	4.38	0.340	2.40	1.49
July 31.....	do.....	12.60	5.21	0.650	2.45	3.36
Aug. 23.....	do.....	12.40	5.00	0.590	2.42	2.93
Sept. 8.....	do.....	13.30	5.83	0.860	2.57	5.88
Nov. 4.....	N. M. Sutherland....	7.80	3.82	1.060	2.59	4.07

CROWSNEST RIVER NEAR LUNDBRECK, ALTA.

This gauging station, located on the N.W. $\frac{1}{4}$ Sec. 26, Tp. 7, Rge. 2, W. 5th Mer., at the traffic bridge just north of Lundbreck, was established September 7, 1907, by P. M. Sauder.

The gauge is a plain staff graduated to feet and hundredths, placed twenty feet downstream from the bridge and about six feet from the water's edge. It is connected with the channel by a ditch which is kept open by the hydrographer on his periodic trips. It is referred to a benchmark on a notch in a tree about twenty yards north of the gauge (elevation, 9.74).

The channel is straight for 250 feet above and 1,500 feet below the station. The right bank is high, wooded and will not overflow. The left bank is low, wooded and liable to overflow in extreme high water. The bed of the stream is of rock, giving a stable cross-section. The current is swift and torrential.

Discharge measurements are made from the bridge, the initial point for soundings being marked on the lower downstream chord, on a line with the face of the left abutment.

During 1911, the gauge was read by C.C. Moore. The tables of daily and monthly discharge for 1911 have not yet been prepared, but will be compiled during 1912 and published with the records for that year.

DISCHARGE MEASUREMENTS of Crowsnest River near Lundbreck, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 24.....	W. H. Green.....	54.0	67.42	1.265	2.82	85.320
Feb. 21.....	do.....	52.0	129.50	0.810	3.26	105.069
Mar. 1.....	do.....	55.0	145.95	0.770	3.18	112.190
Mar. 22.....	J. E. Degnan.....	53.5	76.83	1.760	1.65	135.760
April 10.....	do.....	55.0	79.00	1.780	1.68	141.360
May 19.....	A. W. P. Lowrie....	74.3	234.34	5.710	3.90	1,337.960
June 7.....	do.....	71.0	201.60	5.280	3.50	1,062.280
June 29.....	do.....	67.5	155.00	4.030	2.83	625.790
July 15.....	do.....	64.0	119.90	3.030	2.31	364.480
Aug. 24.....	do.....	60.0	101.25	2.620	2.05	264.810
Sept. 14.....	do.....	67.0	152.25	4.150	2.80	632.380
Nov. 16.....	N. M. Sutherland	65.0	110.95	2.070	2.96	230.200

MEAN DAILY GAUGE-HEIGHT, IN FEET, of Crowsnest River, near Lundbreck, Alta., for 1911.

Day.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	2 25	2 85	3 20	1 73	2 80	3 98	2 82	2 11	1 89	2 30	1 88
2	2 25	2 85	3 40	1 70	2 90	1 30	2 75	2 15	1 89	2 28	1 87
3	2 25	2 85	3 35	1 70	2 95	4 36	2 70	2 18	1 88	2 29	1 88
4	2 55	2 86	3 20	1 60	3 10	4 10	2 64	2 19	2 90	2 28	1 88
5	2 55	2 80	3 35	1 58	3 35	3 95	2 55	2 19	3 60	2 24	1 86
6	2 53	2 90	3 20	1 55	3 50	3 65	2 55	2 15	3 45	2 22	1 85
7	2 63	2 85	3 25	1 65	3 15	3 55	2 55	2 33	3 30	2 20	1 86
8	2 60	2 85	3 22	1 63	3 11	3 49	2 55	3 20	3 25	2 19	1 85
9	2 45	2 88	3 18	1 65	3 00	3 40	2 50	2 90	3 10	2 18	1 83
10	2 55	2 88	3 12	1 68	2 95	3 40	2 45	2 82	3 00	2 15	1 84
11	2 55	3 20	3 00x	1 60	2 89	3 42	2 38	2 70	3 00	2 15	1 84
12	2 70	3 30	2 95x	1 66	2 90	3 50	2 35	2 55	2 99	2 12	1 85
13	2 80	3 20	2 95x	1 66	3 15	3 60	2 35	2 52	2 92	2 12	1 86
14	2 55	3 20	2 95x	1 68	3 01	3 60	2 35	2 40	2 88	2 10	....
15	2 50	3 20	2 90x	1 67	3 50	3 50	2 31	2 32	2 74	2 10	....
16	2 85	3 85	3 00x	1 76	5 50	3 41	2 40	2 30	2 70	2 10	....
17	2 86	3 85	3 00x	1 95	4 81	3 35	2 35	2 25	2 60	2 09	....
18	2 85	3 84	3 00x	1 98	3 30	3 28	2 31	2 20	2 55	2 10	....
19	2 85	3 80	2 85x	2 10	3 95	3 20	2 35	2 17	2 50	2 08	....
20	2 85	2 84	1 73	2 30	3 70	3 05	2 32	2 14	2 45	2 08	....
21	2 86	2 87	1 73	2 60	3 51	3 00	2 25	2 18	2 40	2 05	....
22	2 55	2 95	1 65	2 95	3 36	3 04	2 22	2 12	2 40	2 00	....
23	2 55	3 40	1 70	2 76	3 40	3 00	2 25	2 10	2 38	1 98	....
24	2 55	3 35	1 73	3 00	3 30	3 00	2 25	2 06	2 36	2 00	....
25	2 85	3 31	1 70	3 20	3 19	3 10	2 20	2 05	2 35	1 95	....
26	2 85	3 30	1 63	3 55	3 10	3 10	2 20	2 12	2 32	1 90	....
27	2 82	3 20	1 64	3 25	3 10	3 00	2 20	2 10	2 31	1 90	....
28	2 83	2 95	1 63	3 00	3 25	2 94	2 14	2 08	2 32	1 89	....
29	2 85		1 66	2 85	3 32	2 85	2 10	2 05	2 32	1 88	....
30	2 85		1 70	2 85	3 55	2 80	2 19	2 00	2 31	1 87	....
31	2 84		1 76		3 75		2 18	1 90		1 87	....

x Ice going out

CROWSNEST RIVER NEAR FRANK, ALTA.

This gauging station, located at the traffic bridge on Sec. 36, Tp. 7 Rg. 4 W. 5th Mer., was established on July 28, 1910, by H. C. Ritchie.

The gauge consists of a plain staff graduated to feet and hundredths, placed at the left bank about twenty feet downstream. It is referenced by a bench-mark on spikes driven into a tree-stump within three feet of the gauge (elevation, 9.43).

The channel is straight for about 200 feet above the station and for 500 feet below, both banks being high, wooded and not liable to overflow. The bed of the stream is clean gravel.

The discharge measurements are made from the bridge during high-water stages, the points for soundings being painted on the lower chord. In low stages the river is waded at the same section.

During 1911, the gauge was read by Chas. Richardson.

DISCHARGE MEASUREMENTS of Crowsnest River near Frank, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section	Mean Velocity.	Gauge Height	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 2.	W. H. Greene	48.0	35.30	1.046	3.77	36.94
Jan. 25.	do	50.8	42.87	1.197	3.95	51.30
Feb. 22.	do	47.6	36.70	1.190	3.85	43.69
Mar. 2	do	48.1	36.32	1.150	3.86	41.72
Mar. 23.	J. E. Degnan	54.0	50.07	1.510	4.10	75.67
April 11	do	53.0	51.64	1.440	4.13	74.37
April 29.	do	66.0	103.65	3.696	4.94	383.16
May 20.	A. W. P. Lowrie	71.2	150.54	4.960	5.75	747.85
June 9.	do	71.1	159.77	4.930	5.70	787.92
June 30.	do	70.4	125.31	4.020	5.25	503.78
July 17.	do	66.5	97.93	3.120	4.82	305.90
Aug. 2	do	65.6	79.91	2.310	4.60	184.40
Aug. 25.	do	65.0	68.75	2.360	4.43	162.62
Sept. 15.	do	66.0	93.20	3.340	4.81	311.42
Oct. 16	N. McL. Sutherland	62.0	65.17	2.020	4.38	113.64
Nov. 9.	do	50.2	39.84	1.380	3.96	55.01

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Crowsnest River, near Frank, Alta., for 1911.

DAY	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.78	37	3 92	48	3 86	43	4 20	92	4 94	358	6 38	1,264
2.....	3.80	38	3 93	50	3 86	43	4 22	97	4 97	373	6 55	1,385
3.....	3.82	40	3 93	50	3 86	43	4 18	88	5 05	413	6 50	1,349
4.....	3.82	40	3 93	50	3 86	43	4 14	80	5 26	524	6 35	1,243
5.....	3.83	40	3 93	50	3 85	42	4 11	74	5 60	724	6 10	1,065
6.....	3 86	43	3 93	50	3 85	42	4 10	72	5 58	711	6 00	904
7.....	3 90	46	3 92	48	3 85	42	4 08	69	5 33	562	5 90	924
8.....	3.95	52	3 92	48	3 85	42	4 06	66	5 26	524	5 77	834
9.....	3 89	45	3 91	47	3 86	43	4 06	66	5 15	465	5 77	834
10.....	3 93	50	3 91	47	3 86	43	4 10	72	5 11	443	5 79	847
11.....	3 95	52	3 90	46	3 86	43	4 13	78	4 98	378	5 85	889
12.....	3 95	52	3 90	46	3 82	40	4 12	76	5 06	418	5 98	980
13.....	3 95	52	3 90	46	3 81	39	4 11	74	5 18	481	5 98	980
14.....	3 98	56	3 90	46	3 81	39	4 10	72	5 20	492	5 96	966
15.....	3 99	57	3 90	46	3 85	42	4 12	76	5 50	660	5 90	924
16.....	4 00	58	3 91	47	3 89	45	4 25	104	5 90	924	5 90	924
17.....	4 00	58	3 91	47	3 92	48	4 31	119	5 80	854	5 89	917
18.....	4 00	58	3 91	47	3 97	54	4 45	161	5 78	841	5 81	861
19.....	3 99	57	3 91	47	3 97	54	4 50	178	5 74	814	5 68	775
20.....	3 98	56	3 91	47	*4 03	62	4 75	273	5 65	756	5 52	673
21.....	3 98	56	3 89	45	4 10	72	5 20	492	5 70	788	5 39	596
22.....	3 97	54	3 85	42	4 10	72	5 00	388	5 60	724	5 47	643
23.....	3 96	53	3 85	42	4 09	71	5 10	478	5 51	666	5 38	591
24.....	3 95	52	3 84	41	4 16	84	5 26	524	5 32	557	5 51	666
25.....	3 95	52	3 84	41	4 16	84	5 47	643	5 16	470	5 59	718
26.....	3 95	52	3 85	42	4 16	84	5 36	580	5 97	973	5 47	643
27.....	3 95	52	3 86	43	4 17	86	5 25	519	5 72	801	5 38	591
28.....	3 95	52	3 86	43	4 17	86	4 97	373	5 56	698	5 30	546
29.....	3 95	52			4 18	88	4 98	378	5 70	788	5 22	503
30.....	3 92	48			4 18	88	4 99	383	5 70	788	5 25	519
31.....	3 92	48			4 21	91			5 90	924		

DAILY GAUGE-HEIGHT AND DI-CHARGE of Crowsnest River, near Frank, Alta., for 1911.—Con.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5 20	492	4 59	209	4 35	130	4 51	181	4 23	99	4 09	71
2.....	5 15	465	4 60	212	4 35	130	4 50	178	4 21	94	4 05	65
3.....	5 08	428	4 60	212	4 36	133	4 50	178	4 21	94	4 06	66
4.....	5 00	388	4 59	209	5 80	854	4 49	175	4 20	92	4 08	69
5.....	4 91	343	4 58	205	5 58	711	4 49	175	4 20	92	4 10	72
6.....	4 98	378	4 59	209	5 31	552	4 49	175	4 20	92	4 12	76
7.....	5 00	388	*4 80	294	5 25	519	4 48	171	4 20	92	4 14	80
8.....	4 94	358	*5 00	388	5 10	438	*4 47	168	*4 10	72	4 15	82
9.....	4 90	338	5 18	481	5 00	388	*4 45	161	3 96	53	4 15	82
10.....	4 85	316	5 00	388	5 00	388	*4 43	154	3 86	43	4 12	76
11.....	4 81	298	4 91	343	5 00	388	*4 42	150	3 84	41	4 10	72
12.....	4 79	290	4 79	290	4 99	383	*4 42	150	3 81	39	4 09	71
13.....	4 79	290	4 75	273	4 96	368	*4 44	157	3 77	36	4 08	69
14.....	4 77	281	4 68	244	4 86	320	*4 42	150	3 79	37	4 08	69
15.....	4 79	290	4 67	240	4 82	303	4 40	144	3 85	42	4 09	71
16.....	4 82	303	4 60	212	4 77	281	4 39	141	3 89	45	4 04	64
17.....	4 82	303	4 58	205	4 70	252	4 37	136	3 92	48	4 00	58
18.....	4 80	294	4 50	178	4 67	240	4 36	133	3 96	55	3 97	54
19.....	4 78	286	4 49	175	4 61	216	4 35	130	4 02	61	3 95	52
20.....	4 75	273	4 50	178	4 60	212	4 33	124	4 05	65	3 97	54
21.....	4 71	256	4 50	178	4 60	212	4 32	122	4 09	71	3 98	56
22.....	4 69	248	4 46	161	4 59	209	4 31	119	4 14	80	3 99	57
23.....	4 67	240	4 43	154	4 57	202	4 30	116	4 16	84	4 03	62
24.....	4 62	220	4 43	154	4 56	198	4 29	114	4 18	88	3 98	56
25.....	4 62	220	4 43	154	4 55	195	4 28	111	4 18	88	3 95	52
26.....	4 59	209	4 45	161	4 55	195	4 26	106	4 14	80	3 96	53
27.....	4 56	198	4 43	154	4 54	192	4 26	106	4 09	71	3 99	57
28.....	4 57	202	4 40	144	4 55	195	4 25	104	4 05	65	3 96	53
29.....	4 57	202	4 38	138	4 54	192	4 24	102	4 05	65	3 94	51
30.....	4 60	212	4 37	136	4 53	188	4 24	102	4 09	71	3 92	48
31.....	4 55	195	4 35	130	....	....	4 23	99	....	....	*3 91	47

* Gauge height interpolated.

MONTHLY DISCHARGE of Crowsnest River near Frank, Alta., for 1911.

Drainage area, 170 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January.....	58	37	50.3	0.296	0.34	3,093
February.....	50	41	46.1	0.271	0.28	2,560
March.....	94	39	58.1	0.342	0.39	3,572
April.....	643	66	224.0	1.340	1.50	13,329
May.....	973	358	642.0	3.780	4.36	39,475
June.....	1,385	503	85.5	5.030	5.61	50,876
July.....	492	195	297.0	1.750	2.02	18,262
August.....	481	130	220.0	1.390	1.60	13,527
September.....	519	130	306.0	1.800	2.01	18,208
October.....	181	99	135.7	0.798	0.92	8,344
November.....	99	36	68.5	0.403	0.45	4,076
December.....	82	47	63.4	0.373	0.43	3,898
The year..						179,220

CROWSNEST RIVER NEAR COLEMAN, ALTA.

This gauging station, located on the S.W. 1⁴ Sec. 12, Tp. 8, Rge. 5, W. 5th Mer., at a private bridge about two and a half miles west of Coleman, was established July 28, 1910, by H. C. Ritchie.

SESSIONAL PAPER No. 25d

The gauge is a plain staff graduated to feet and hundredths, placed at the left bank about 150 feet upstream from the bridge. It is referred to a bench-mark on top of a post thirty feet west of the gauge (elevation 10.16).

The channel is straight for 30 feet above and 300 feet below the station. Both banks are high, wooded, and will not overflow. The bed of the stream is of sand and gravel. The current is fairly swift.

Discharge measurements are made from the bridge during high-water stages, the initial point for soundings being on line with the face of the left abutment. In low stages the stream is waded three quarters of a mile downstream from the bridge.

The gauge is read by Prudent LeGal, whose house is about forty feet away. The tables of daily and monthly discharge for 1911 have not yet been prepared, but will be compiled during 1912 and published with the records for that year.

DISCHARGE MEASUREMENTS of Crowsnest River, near Coleman, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 11	J. E. Degnan.....	27.0	42.80	0.991	3.95	42.44
May 1	do	30.0	58.73	2.015	4.71	118.35
May 23	A. W. P. Lowrie.	42.0	84.25	3.580	5.64	301.67
June 12	do	39.0	121.80	4.200	7.11	512.02
July 1	do	37.0	87.16	4.030	5.92	352.11
July 18	do	36.0	79.00	2.740	5.42	216.29
Aug. 3	do	35.0	68.85	2.250	5.10	154.80
Aug. 26	do	44.0	42.11	2.030	4.72	85.38*
Sept. 18	do	44.0	44.46	2.260	4.89	100.28
Oct. 15	N. M. Sutherland	33.0	78.70	0.600	4.80	47.24
Oct. 17	do	43.0	37.70	2.450	4.80	92.22*
Dec. 4	do	31.5	24.23	1.790	4.08	43.40†
Dec. 18	do	28.0	22.48	1.420	4.45	31.90x

*Gauged one mile below regular station.
xGauged one half mile below rod.
†Open water.

MEAN DAILY GAUGE-HEIGHT, IN FEET, of Crowsnest River, near Coleman, Alta., for 1911.

Day.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
1		3 93	4 72	6 42	5 72	4 90	4 52	4 60	3 22	4.14
2		3 82	4 73	6 70	5 72	5 02	4 52	4 60	3 22	4.13
3		3 80	4 80	6 83	5 63	4 95	4 62	4 53	3 22	4.13
4		3 81	4 82	6 72	5 54	4 90	5 53	4 52	3 22	4.13
5		3 85	4 85	6 41	5 51	4 92	5 46	4 53	3 21	4.12
6		3 80	4 90	6 10	5 52	5 00	5 43	4 52	3 20	4.10
7		3 80	5 13	6 13	5 50	5 02	5 31	4 52	3 40	4.10
8		3 81	5 14	6 10	5 51	5 35	5 10	4 45	3 50	4.10
9		3 90	5 30	6 13	5 34	5 30	5 00	4 45	5 30	4.10
10		3 90	5 10	6 10	5 30	5 11	5 06	4 43	5 45	4.10
11		3 84	4 93	6 32	5 31	5 13	5 12	4 41	5.40	4.10
12		3 80	4.91	6 93	5 30	5 12	5 20	4 40	5 10	4.11
13		3 83	4 93	6 50	5 25	4 90	5 21	5 00	5 60	3.96
14		3 82	4 93	6 73	5 32	4 93	5 10	4 40	5 80	3.96
15		3 84	5 30	6 63	5 30	4 92	5 02	4 60	5 90	3.96
16		3 85	6 12	6 52	5 31	4 83	4 95	4.30	5 70	3 96
17		3 86	6 11	6 30	5 33	4 81	4 83	4 00	5 63	3.96
18		3 90	6 00	6 21	5 22	4 75	4 81	4 10	5 63	4.45
19	3 51	3 92	5 80	6 20	5 20	4 72	4 73	4 00	5 60	4.70
20	3.62	3 95	5 70	6 13	5 10	4 73	4 72	3 35	5 55	4.40
21	3.70	4 15	5 72	6 10	5 12	4 72	4 72	3 32	5.50	4.03
22	3.74	4 13	5 70	6 12	5 10	4.70	4 70	3 32	4 00	4.06
23	3.90	4 23	5 63	6 10	5 12	4 64	4 71	3.32	3 00	4.05
24	3.96	4 33	5 43	6 10	5 11	4.62	4 71	3 32	3 50	3.95
25	4.05	4 50	5 20	6 21	5 11	4 61	4 65	3 32	4 00†	3.00
26	3.80	4 56	5 43	6 12	5.10	4 55	4 65	3 32	4 40†	3.04
27	3.80	4 62	5 45	5 93	5 02	4 60	4 62	3.30	4 40	3.06
28	3.92	4 63	5 42	5 83	5 00	4.53	4 61	3 30	4 63	3.09
29	4.00	4 65	5 42	5 75	4 93	4 53	4 61	3 30	4 70	4.05
30	3.85	4 70	5 51	5 75	4 90	4.53	4 61	3 25	4 24	4.10
31	3.81		6 21		4 93	4 52		3 23		4.10

† Snow.

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Oldman River, Alta., Drainage Basin, in 1911.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Dis-charge.
				Feet.	Sq.-ft.	Feet per second.	Sec.-ft.
May 1	J. E. Degnan...	Blairmore Creek.....	Sec. 3-8-4-5.....	24.0	20.38	2.758	56 210
May 20	A. W. P. Lowrie....	"	" 34-7-4-5.....	23.6	22.84	3.000	68 610
June 9	"	"	" 10-8-4-5.....	22.8	16.97	2.380	40 520
July 1	"	"	" 10-8-4-5.....	9.6	7.23	2.690	19 440
July 17	"	"	" 10-8-4-5.....	7.5	4.57	1.680	7 710
Aug. 3	"	"	" 10-8-4-5.....	7.6	5.08	1.530	7 880
Aug. 25	"	"	" 10-8-4-5.....	7.4	5.51	1.820	10 020
Sept. 15	"	"	" 10-8-4-5.....	23.0	15.26	1.600	24 460
Aug. 25	"	Callum Creek.....	N.E. 6-10-1-5.....	15.3	10.474	1.243	12 930
Oct. 23	"	Carmichall's Spring..	S.E. 34-13-29-4....	x			0 130
June 26	"	Elton's Ditch.....	Sec. 19-8-1-5.....	2.10	0.50	0.780	0 390
Sept. 10	"	Fortier's Spring*.....	" 17-7-1-5.....	x			Nil.
Sept. 10	"	"	" 17-7-1-5.....	x			0 011
Sept. 10	"	"	" 17-7-1-5.....	x			0 003
Oct. 11	N. M. Sutherland.	Fortier's Spring East.	" 17-7-1-5.....	x			0 008
Oct. 11	"	" West	" 17-7-1-5.....	x			0 011
Nov. 3	"	"	" 17-7-1-5.....	x			0 006
Dec. 1	"	"	" 17-7-1-5.....	x			0 002
April 11	J. E. Degnan.....	Gold Creek.....	" 31-7-3-5.....	21.0	12.48	1.054	13 16
April 29	"	"	" 31-7-3-5.....	22.9	21.21	2.382	50 530
May 23	A. W. P. Lowrie ..	"	" 30-7-3-5.....	24.0	29.13	2.900	85 000
June 10	"	"	" 30-7-3-5.....	24.0	26.06	2.770	71 940
July 18	A. W. P. Lowrie ..	Gold Creek.....	Sec. 30-7-3-5.....	21.80	16.39	1.740	28 59
Aug. 4	"	"	" 30-7-3-5.....	20.70	14.93	1.680	25 12
Aug. 26	"	"	" 30-7-3-5.....	21.20	15.40	1.580	24 30
Sept. 18	"	"	" 30-7-3-5.....	23.50	23.40	2.930	68 55
Oct. 17	N. M. Sutherland.	"	" 30-7-3-5.....	21.10	20.38	1.850	37 68
April 29	J. E. Degnan.....	Lyon Creek.....	N.E. 35-7-4-5.....	20.60	18.50	2.718	50 30
May 22	A. W. P. Lowrie ..	"	Sec. 26-7-4-5.....	20.80	21.46	2.930	62 89
June 9	"	"	" 26-7-4-5.....	15.80	12.09	2.320	28 02
June 30	"	"	" 26-7-4-5.....	13.00	6.93	1.310	9 08
Oct. 16	N. M. Sutherland..	"	" 26-7-4-5.....	10.70	6.72	1.480	9 92
May 1	J. E. Degnan.....	McGillivary Creek...	S.E. 7-8-4-5.....	18.80	19.16	1.570	30 09
June 10	A. W. P. Lowrie ..	"	Sec. 7-8-4-5.....	20.20	25.01	2.000	50 12
July 1	"	"	" 7-8-4-5.....	17.40	18.09	1.170	21 11
July 18	"	"	N.E. 7-8-4-5.....	15.40	12.54	0.750	9 40
Aug. 3	"	"	Sec. 7-8-4-5.....	15.00	11.34	0.620	7 07
Aug. 26	"	"	N.E. 7-8-4-5.....	15.20	11.24	0.510	6 74
Sept. 18	"	"	" 7-8-4-5.....	15.80	13.53	0.694	9 39
Oct. 17	N. M. Sutherland..	"	" 7-8-4-5.....	10.00	4.88	1.360	6 65
Dec. 4	"	"	" 7-8-4-5.....	5.20	1.78	0.890	1 58
May 1	J. E. Degnan.....	Nez Perce Creek.	Sec. 17-8-4-5.....	14.10	12.54	2.184	27 39
July 1	A. W. P. Lowrie....	"	" 17-8-4-5.....	12.60	8.84	0.890	7 89
July 18	"	"	" 17-8-4-5.....	12.20	6.87	0.60	4 130
Sept. 18	"	"	" 17-8-4-5.....	12.30	6.75	0.84	5 670
Oct. 17	N. M. Sutherland..	"	" 17-8-4-5.....	10.00	4.40	0.96	4 240
July 25	J. C. Milligan ..	Sorrel Horse Creek.	N.E. 26-13-30-4....	x			0 028
July 25	"	"	" 26-13-30-4....	x			0 039
July 25	"	Spring A.....	L.S. 14 Sec. 35-13-1-5	x			0 028
July 25	"	"	S.W. 2-14-1-5.....	x			0 010
July 25	"	"	L.S. 13 Sec. 35-13-1-5.	x			0 018
Oct. 20	"	"	S.E. 21-14-1-5.....	x			0 069
July 12	"	Spring Creek.....	N.W. Sec. 31-14-1-5	x			0 010
July 13	"	"	N.E. 6-15-1-5.....	x			0 899
July 14	"	"	S.W. 5-15-1-5.....	x			0 018
July 24	"	"	N.E. 28-13-2-5.....	x			0 050
July 25	"	"	N.E. 27-13-1-5.....	x			0 018
July 27	"	"	S.E. 34-13-1-5.....	x			0 010
Aug. 16	"	"	N.W. 23-11-30-4....	x			0 018
Sept. 26	A. W. P. Lowrie.	"	S.E. 34-13-29-4....	x			0 515
Oct. 20	J. C. Milligan.....	"	S.E. 21-14-1-5.....	x			0 590
Sept. 16	A. W. P. Lowrie	Summit Creek.	S.W. 12-8-6-5.....	4.40	0.87	0.69	0 600
Nov. 11	N. M. Sutherland.	"	S.W. 12-8-6-5.....	4.00	0.98	0.49	0 480
April 18	J. E. Degnan....	Willow Creek..	S.W. 36-12-28-4....	24.00	30.80	2.57	79 110
July 24	A. W. P. Lowrie ..	"	S.W. 36-12-28-4....	22.30	27.10	1.56	42 300

SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Oldman Riner, Alta., Drainage Basin, in 1911.—Continued.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Dis-charge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Feet per Sec.</i>	<i>Sec.-ft.</i>
Oct. 21	N. M. Sutherland...	Willow Creek.....	S.W. 36-12-28-4	87.00	108.60	1.00	108.800
May 1	J. E. Degnan.....	York Creek.....	N.W. 34-7-4-5.....	21.50	21.22	1.943	41.24
May 20	A. W. P. Lowrie....	"	"	22.60	24.37	2.720	66.35
June 9	"	"	"	23.80	24.81	3.040	75.44
July 1	"	"	"	21.60	20.76	2.040	42.40
July 17	"	"	"	19.00	15.12	1.140	17.30
Aug. 3	"	"	"	20.00	14.04	1.090	15.26
Aug. 25	"	"	"	20.00	11.50	0.970	11.12
Sept. 15	"	"	"	20.07	15.23	1.370	20.82
Oct. 17	N. M. Sutherland.	"	"	11.50	8.55	1.290	11.01

xWeir measurement.

WATERTON RIVER DRAINAGE BASIN.

General Description.

Waterton River rises in the northwestern portion of the state of Montana, in the eastern slope of the Rocky mountains. It flows in a northerly direction and passing through a chain of lakes near the International Boundary, known as Waterton lakes, it continues in a north and easterly direction and finally empties into Belly River near Stand Off, Alta.

The topography of the basin is of a varied character, ranging from the mountainous regions of Montana to the rolling prairie of Southern Alberta. The tributaries are situated mostly in the upper portion of the basin, near the International Boundary, and from the west side.

There is a large snow-fall in the upper portion of the basin, and the melting of this, combined with heavy rains, often causes big floods on this river in the early summer. Thereafter the river steadily decreases in volume, until the minimum is reached about mid-winter.

Waterton lakes offer a very favourable site for a storage reservoir, approximately 14 miles long and one mile wide. The steep rocky banks of the narrows make an ideal site for the construction of a dam. The flow could be more than doubled during the summer months and used for irrigation purposes, or a power project could easily be developed.

WATERTON RIVER AT WATERTON MILLS.

This station was established on August 26, 1908, by P. M. Sauder. It is located on the N.E. ¼ Sec. 8, Tp. 2, Rge. 29, W. 4th Mer., about 250 feet below the river's outlet from the Lower Waterton Lake.

The gauge, which is a plain staff graduated to feet and hundredths, is placed in a stilling box at the right bank. The zero (elev., 90.51) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated within six feet of the gauge.

The channel is wide and straight for 250 feet above and 400 feet below the station. Both banks are high, slightly wooded, and will not overflow. The bed of the stream is rough and rocky with a stable cross-section. The current is always rather swift at mid-stream.

Discharge measurements are made from a cable car during high stages. In low water the stream can be waded almost all the way across, the deep channel in the centre being taken from the cable car. Measurements are often affected by the heavy winds, which frequently occur. The points for soundings are marked by a tagged wire stretched above the cable.

During 1911, the gauge was read by Mr. H. H. Hanson. The commutator of the meter used in making most of the discharge measurements at this station in 1911 was accidentally broken, and before it could be repaired the rating station was frozen up and the meter could not be rated. The records are, therefore, withheld until the meter is rated and the computations checked.

CROOKED CREEK NEAR WATERTON MILLS, ALTA.

This station was established on September 15, 1909, by H. C. Ritchie. It was at first located on the S.E. ¼ Sec. 22, Tp. 2, Rge. 29, W. 4th Mer., but as an observer could not be secured at this point it was moved on June 15, 1911, by L. J. Gleeson to a point about 250 feet from Ernest Allred's house on the S.W. ¼ Sec. 23, Tp. 2, Rge. 29, W. 4th Mer. It is now about 27 miles from Cardston and 3 miles from Waterton Mills Post Office.

The stream flows in one channel at all stages. It is straight for forty feet above and twenty feet below the station. The bank is high, covered with brush, and not liable to overflow. The right bank is low, clear at the station, and liable to overflow. The bed is composed of gravel, but is not liable to shift, except in flood stage.

Discharge measurements are made by wading thirty feet upstream from the gauge. The initial point for soundings is at a stump of a small tree on the left bank. During flood periods the stream cannot be waded at this point, but gaugings can be made at a bridge about one and a half miles downstream.

The gauge which is a plain staff graduated to feet and hundredths, is nailed to a corral post in the centre of the creek. The zero (elev., 91.86) is referred to two nail-heads in a post (assumed elev., 100.00), situated about ten feet south of the gauge.

During 1911, the gauge was read by Ernest Allred.

The commutator of the meter used in making most of the discharge measurements at this station in 1911 was accidentally broken, and before it could be repaired the rating station was frozen up and the meter could not be rated. The records are, therefore, withheld until the meter is rated and the computations checked.

BELLY RIVER DRAINAGE BASIN.

General Description.

Belly River rises near Chief mountain in northern Montana. The main stream is augmented, on the United States side of the boundary line, by Middle Fork, and, on the Canadian side, by North Fork. From the junction with North Fork on Sec. 21, Tp. 1, Rge. 28, W. 4th Mer., the river flows in a winding, northeasterly course until it is joined by Oldman River in Sec. 27, Tp. 9, Rge. 23, W. 4th Mer., where it turns southeasterly, and, after making a loop, flows in a northeasterly direction until it joins Bow River in Sec. 27, Tp. 11, Rge. 13, W. 4th Mer., and forms South Saskatchewan River.

The topography of the basin is of the most varied character, ranging from the mountainous regions of Montana and the rolling prairie and foothills at the boundary, to the level prairie from Lethbridge to the junction with Bow River. The upper tributaries drain a forested region, but the main stream flows through a deep valley with many bluffs of large whitewood on its banks.

There is an abundant snow-fall in the upper portion of the basin, but the precipitation diminishes until semi-arid conditions are met near Lethbridge. At first Belly River is a comparatively clear stream, but soon after crossing the boundary line it becomes turbid, especially at times of high water. The greater portion of the sediment is caused by the washing away of banks and cutting of new channels. Freshets caused by melting snow and heavy rains are frequent in the summer. The maximum flow usually occurs in June or July, and after that the flow gradually decreases until it reaches the minimum in January or February.

As yet very little use has been made of the water in this basin. In the upper regions where water could easily be diverted it is not required for irrigation purposes, and further downstream it would be an expensive undertaking.

There a couple of small private irrigation schemes diverting water from Belly River, and the city of Lethbridge will in the near future receive their domestic supply from the same source.

The Alberta Railway and Irrigation Company have located and may construct a canal from Belly river to supply their irrigation system, if St. Mary River is found deficient. There are also a number of sites in the upper regions where power can be developed and which will no doubt be developed when there is a market.

BELLY RIVER NEAR MOUNTAIN VIEW, ALTA.

This station was established on Nov. 1, 1911, by H. R. Carscallen. It is situated in the N.E. ¹/₄ Sec. 5, Tp. 2, Rge. 23, W. 4th Mer., and is six miles southwest of Mountain View post office.

The channel is straight for 250 feet above the station and for 350 below. The bed is composed of gravel and sand. The right bank is high, slightly wooded and will not overflow except during extreme high water. The left bank is low, quite well wooded, and will overflow.

Discharge measurements are made by means of a cable-car, tagged wire, and stay wire. The initial point for soundings is a ship-spike driven into the downstream cable-support on the left bank, and is marked by red paint on the measuring wire.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to a post sunk in the stream bed at the right bank. The zero (elev., 88.16) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated beneath the centre of the cable support on the right bank.

The gauge was read by J. N. West, but as this station was established so late in the season there are not sufficient data to compute daily and monthly discharges, and the records for this station for 1911 will be completed during 1912, and published with the records for that year.

SESSIONAL PAPER No. 25d.

DISCHARGE MEASUREMENTS of Belly River near Mountain View, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Nov. 1.....	L. J. Gleeson	86.5	212.20	0.880	2.075	187.60
Dec. 10.....	D. D. Macleod.....	83.0	168.86	0.603	2.010	101.82*

* Ice conditions

MAMI CREEK NEAR MOUNTAIN VIEW, ALTA.

This station was established on August 13, 1909, by H. C. Ritchie. It is located at the traffic bridge on the road allowance north of the N.E. $\frac{1}{4}$ Sec. 18, Tp. 2, Rge. 27, W. 4th Mer., and is just below the junction of the east and west branches.

The channel is curved for about 100 feet above the bridge and straight for 200 feet below. Both banks are high, clear of brush, rocky and liable to overflow in extreme high water. The bed of the stream is composed of stones covered with sand and gravel.

Discharge measurements are made during high water from the bridge. In low water the east branch dries up and the west branch is waded just above the junction.

The gauge is a plain staff graduated to feet and hundredths, fastened to a pile supporting the bridge at the left bank. The zero (elev., 90.70) is referred to nailheads (assumed elev. 100.00) on a pile on the right bank.

Gaugings were made at this station during 1911, but, as the flow of the stream is very small and records were of little value, no observer was employed. As two applications, one for irrigation and the other for domestic purposes, have recently been received, arrangements are being made to employ an observer during 1912. No water was diverted in 1911.

The commutator of the meter used in making most of the discharge measurements at this station in 1911 was accidentally broken, and, before it could be repaired, the rating station was frozen up and the meter could not be rated. The results of the gaugings are therefore withheld until the meter is rated, and the computations checked.

CHRISTIANSON DITCH NEAR CALDWELL, ALTA.

This station was established on Sept. 14, 1911, by L. J. Gleeson. It is situated in the S.E. $\frac{1}{4}$ Sec. 12, Tp. 3, Rge. 8, W. 4th Mer., on Elias Christianson's irrigation ditch. It is six miles northwest of Mountain View and one quarter of a mile south of Big Bend police post.

The channel is straight for 300 feet above and 100 feet below the station. The main ditch is about 400 feet long and four feet wide, and has a good fall.

Discharge measurements have been made with a small Price meter, but a weir would give more satisfactory results.

The gauge is a plain staff graduated to feet and tenths. It is driven into the channel of the ditch, on the line of the gauging section. The zero of the gauge (elev., 96.30) is referred to a bench-mark (assumed elev., 100.00) situated on the left bank close to the gauge.

No water was diverted through this ditch during 1911 after the gauge was established, and therefore there are no records.

BELLY RIVER NEAR STAND OFF, ALTA.

This station was established on May 27, 1909, by H. C. Ritchie. It is eighteen miles south of the town of Macleod, and is located on the S.E. $\frac{1}{4}$ Sec. 21, Tp. 6, Rge. 25, W. 4th Mer., 200 yards from George Pearson's house.

The gauge, which is a plain staff graduated to feet and hundredths, is secured by braces to the left bank. The zero (elev., 92.51) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated 35 feet upstream from the gauge.

Discharge measurements are made during the open season from the traffic bridge on the S.E. $\frac{1}{4}$ Sec. 21, Tp. 6, Rge. 25, W. 4th Mer., the points for soundings being painted on the lower chord of the superstructure. During the frozen period they are made at or near the gauge.

For a distance of 75 feet above and 60 feet below the section, the channel is straight. The current runs smooth with a moderate velocity over a bed of clean gravel. Both banks are low, free from brush, and liable to overflow during high stages of the river. Since the establishment of this station the cross-section has changed very little, if any, but owing to the sharp turns in the channel the river is liable to take a new course altogether in times of extreme flood.

During 1911, the gauge was read by George Pearson. The commutator of the meter used in making most of the discharge measurements at this station in 1911 was accidentally broken and before it could be repaired, the rating station was frozen up and the meter could not be rated. The records are, therefore, withheld until the meter is rated and the computations checked. During the winters of 1910-11 and 1911-12 records of the flow under the ice were secured.

BELLY RIVER NEAR LETHBRIDGE, ALTA.

This station was established on August 31, 1911, by A. W. P. Lowrie. It is located at the traffic bridge on the N.W. ¼ Sec. 1, Tp. 19, Rge. 22, W. 4th Mer., and is about two and a half miles from Lethbridge post office.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to the second pier from the east end of the bridge. The zero of the gauge (elev., 87.82) is referred to a bench-mark on the west face of the east pier (assumed elev., 100.00).

The channel is straight for 800 feet above and 2000 feet below the station. The right bank is not very high and might overflow in flood stages of the stream. The left bank is low and is liable to overflow during very high water. The bed of the stream is composed of sand and gravel but is not liable to shift.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is near the west end of the bridge and distances are marked on the hand-rail with white paint.

Tables of daily and monthly discharge for 1911, have not been computed. These will be finished during 1912 and will be published with the records for that year.

DISCHARGE MEASUREMENTS of Belly River, near Lethbridge, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 6.....	L. J. Gleeson.....	243.6	1,080 5	1.25	.. .	1,354.7
May 9.....	do	476.6	2,844 0	2.92	.. .	8,300.0
May 27.....	A. W. P. Lowrie.	458.9	2,993 7	3.27	.. .	9,813.9
June 15.....	do	573.6	3,947 3	4.96	.. .	19,592.8
July 5.....	do	449.0	2,960 4	2.90	.. .	8,605.0
July 21.....	do	372.0	2,014 1	2.01	.. .	4,051.3
Aug. 16.....	do	378.1	2,297 5	2.31	.. .	5,297.4
Aug. 31.....	do	353.5	1,733 8	1.57	1.28	2,719.4
Oct. 25.....	N. Sutherland...	388.0	1,672 2	1.43	1.21	2,388.6
Dec. 6.....	D. D. MacLeod	200.0	1,288 5	1.27	0.75	1,631.6

ST. MARY RIVER DRAINAGE BASIN.

General Description.

St. Mary River, an important tributary of the Belly River and so indirectly of the South Saskatchewan River, heads in northern Montana on the eastern slope of the main range of the Rocky Mountains. It starts from the great Blackfoot glacier and receives affluents from numerous lesser glaciers. These streams unite within a short distance from their source and flow into Upper St. Mary lake. Below this lake, and in close proximity to it, is lower St. Mary lake, the aggregate lengths of the two being about 22 miles. The river flows out of the lower lake, at an elevation of 4460 feet above mean sea-level, and takes a northerly course through the foothills to the International Boundary. From the boundary it flows in a northeasterly direction, through a rolling country, finally emptying into the Belly River near Lethbridge, Alta.

The basin is bounded on the south by the Rocky mountains, on the west by the watershed between Belly and St. Mary rivers and on the east by the watershed between Milk and St. Mary rivers. The upper portion of the basin is heavily timbered and receives its precipitation mostly in the shape of snow-fall, but the lower and major portion is totally devoid of tree growth, and has a small precipitation.

The river flows through a very deep valley. It has steep banks and this makes the diversion of water from this stream for irrigation an expensive undertaking. In Canada, the Alberta Railway and Irrigation Company has water rights on this river. The head-gates of their canal are at Kimball, five miles north of the boundary, and they already have 231 miles of ditch constructed which irrigates land surrounding Lethbridge. Further construction is being planned and the works, when completed, will irrigate approximately 500,000 acres of land, at present semi-arid.

As this is an international river, discharge measurements are taken by the Hydrographic Surveys services of both the Canadian and American governments. It is expected that in the near future the hydrographers of both countries will use a common gauging station at a point as near the International Boundary as a suitable site can be found. It is hoped in this way to obtain results of high degree of accuracy and perfectly satisfactory to both countries.

FIDLER BROTHERS' DITCH AT BOUNDARY CREEK, ALTA.

This station was established on Sept. 13, 1911, by L. J. Gleeson. It is situated in the S.E. $\frac{1}{4}$ Sec. 19, Tp. 1, Rge. 26, W. 4th Mer., on Fidler Brothers' irrigation ditch, one quarter of a mile southwest of Cardston.

The channel of the ditch is straight for a distance of thirty feet above and twenty feet below the gauge. The soil is clay with a little sand.

Discharge measurements can be made with a small Price meter, but on account of the small velocity a weir would be more suitable.

The gauge is placed in the centre of the ditch, 100 feet downstream from the head-gate. It is a plain staff graduated to feet and tenths. The zero of the gauge (elev., 93.62) is referred to a wooden bench-mark (assumed elev., 100.00) situated on the left bank, eight feet west of the gauge, and on the line of the gauging section.

As the ditch was not used after the gauge was established no records were secured at this station in 1911.

ST. MARY RIVER AT KIMBALL, ALTA.

This station was established by the Alberta Railway and Irrigation Company in 1905. It is located on the S.W. $\frac{1}{4}$ Sec. 25, Tp. 1, Rge. 25, W. 4th Mer., about half a mile above the company's dam and head-gate.

The channel is straight for about 450 feet above and 400 feet below the station. Both banks are high and not liable to overflow. The right bank is partly covered with scrub above the station, but at and below the station it is clear. The bed of the stream is of gravel and is liable to slight changes. The current is quite uniform all the way across the stream.

Discharge measurements are made by means of a cable car, and tagged wire at high and ordinary stages. At low-water periods, the river can be waded. The initial point for soundings is the zero of the tagged wire, which is 44.8 feet from the inside edge of the cable support on the right bank.

The gauge, which is a plain staff graduated to feet and hundredths, is set in the right bank, a few feet upstream from the cable. A trench lined with plank connects a stilling box about the gauge with the channel in low water. The zero of the gauge (elevation 86.87) is referred to a permanent iron bench-mark (assumed elevation, 100.00) situated near the cable support on the right bank. In 1911, the gauge was read by J. M. Dunn, ditch rider for the A. R. & I. Co.

This station is not satisfactory during the frozen period and during the winter months gauge-heights and discharges are observed at a temporary gauging station located at the traffic bridge about two miles below the regular station.

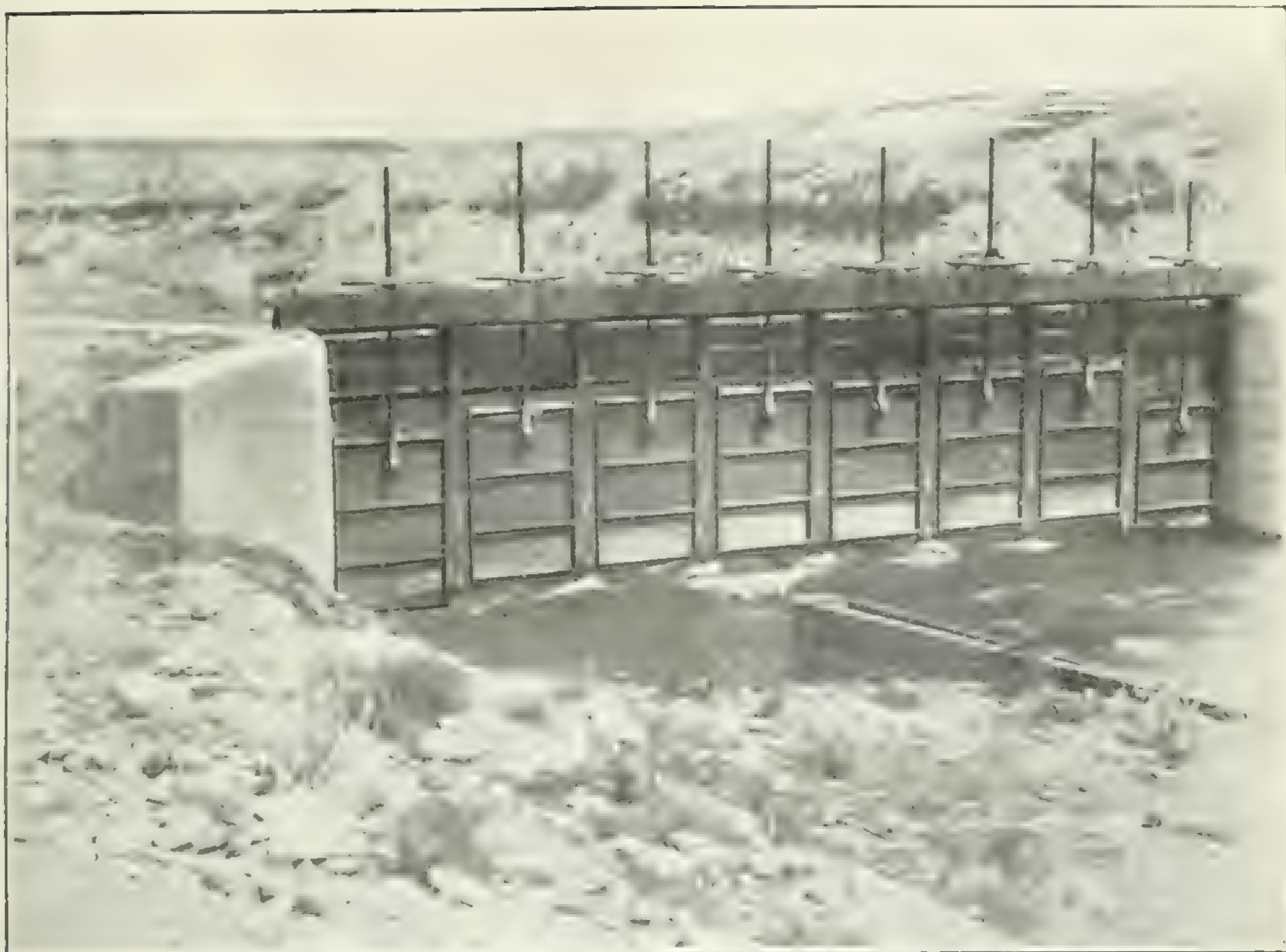
DISCHARGE MEASUREMENTS of St. Mary River at Kimball, in 1911.

DATE.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		Feet.	Sq.-feet.	Ft. per sec.	Feet.	Sec.-feet.
Jan. 16	W. H. Green .	100.7	173.9	1.21	6.26	210.2
Feb. 3...	"	66.0	100.3	2.02	5.53	202.4
Mar. 16 ..	J. E. Degnan..	68.0	82.1	1.73	4.95	141.6
Mar. 29...	"	150.0	224.6	1.60	4.63	360.3
April 1..	"	65.0	108.1	2.95	4.15	318.8
April 8...	L. J. Gleeson..	62.8	97.2	2.80	5.20	271.8
April 21...	"	220.8	376.5	1.42	2.82	536.2
May 1..	"	223.8	499.4	2.16	3.28	1076.2
May 16...	"	227.4	893.1	4.27	5.00	3812.0
May 19. ...	"	226.0	796.1	3.70	4.56	2945.3
June 3....	"	228.0	869.6	3.83	5.00	3330.3
June 7.....	"	227.5	858.6	3.84	4.78	3208.6
June 9.....	"	226.9	836.0	3.90	4.77	3261.3
June 20	"	228.0	904.2	4.26	5.05	3855.4
June 27	"	227.7	841.1	3.90	4.78	3284.0
July 12.	"	224.8	604.8	2.81	3.81	1702.0
July 20	"	225.0	574.9	2.76	3.70	1584.9
July 20.	"	225.0	573.8	2.76	3.70	1582.1
Aug. 3.	"	222.5	513.7	2.28	3.41	1170.9
Aug. 16.	"	222.5	473.9	2.24	3.28	1059.5
Aug. 16.....	"	222.0	473.9	2.28	3.28	1082.8
Aug. 29.....	"	222.4	415.0	1.78	2.97	736.9
Sept. 7.....	"	225.0	598.4	2.74	3.77	1639.7
Sept. 23.....	"	224.5	575.5	2.48	3.65	1428.5
Oct. 7.	"	221.6	436.1	1.72	3.07	753.1
Nov. 16.....	"	65.0	122.3	2.62	6.30	320.6
Dec. 12	D. D. McLeod	102.0	103.3	1.28	1.51	131.9

DAILY GAUGE-HEIGHT AND DISCHARGE of St. Mary River at Kimball, for 1911.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	6 43	220	5 85	206	5 45	194	4 15	319	3 29	1074	4 27	2388
2.....	6 43	219	5 84	206	5 40	188	4 20	322	3 29	1074	4 87	3480
3.....	6 40	218	5 53	202	5 40	188	4 53	287	3 32	1108	5 01	3793
4.....	6 35	216	5 55	204	5 35	183	4 57	289	3 39	1188	5 10	4000
5.....	6 15	213	5 54	203	5 33	181	4 58	289	3 57	1407	4 98	3725
6.....	6 35	215	5 65	214	5 30	178	5 05	265	3 87	1794	4 88	3502
7.....	6 36	214	5 65	214	5 21	169	5 04	265	3 97	1933	4 77	3270
8.....	6 10	210	5 47	196	5 12	159	5 20	272	3 97	1933	4 79	3310
9.....	5 60	203	5 35	183	5 14	161	5 00	263	3 92	1863	4 77	3270
10.....	4 95	194	5 35	183	4 90	136	2 55	296	3 90	1835	4 77	3270
11.....	* 4 95	194	5 45	194	4 85	131	2 45	330	3 87	1794	4 88	3502
12.....	* 5 62	203	5 40	188	4 85	131	2 30	250	3 80	1700	5 09	3977
13.....	6 30	213	5 35	183	4 90	136	2 30	250	3 87	1794	5 19	4207
14.....	6 30	213	5 27	175	4 90	136	2 32	260	3 99	1961	5 27	4391
15.....	6 31	213	5 25	173	4 87	133	2 35	275	4 42	2629	5 27	4391
16.....	6 26	212	5 23	171	4 95	142	2 40	300	5 03	3839	5 24	4322
17.....	6 25	212	5 20	167	4 85	131	2 50	360	4 96	3680	5 19	4207
18.....	6 30	213	5 23	171	4 95	145	2 53	382	4 80	3330	5 17	4161
19.....	6 35	213	5 30	178	5 06	158	2 55	398	4 57	2891	5 10	4000
20.....	6 35	213	5 35	183	5 25	181	2 65	472	4 39	2579	5 04	3862
21.....	6 30	213	5 35	183	5 20	181	2 82	607	4 30	2435	4 97	3702
22.....	6 25	212	5 38	185	5 25	189	2 95	722	4 28	2404	4 90	3545
23.....	6 12	210	5 38	185	5 20	186	3 10	870	4 27	2388	4 92	3590
24.....	6 15	210	5 40	188	5 20	186	3 14	912	4 25	2358	4 97	3702
25.....	6 10	210	5 41	189	5 00	165	3 18	954	4 14	2187	5 17	4161
26.....	6 00	208	5 42*	190	4 60	285	3 28	1063	4 07	2080	4 97	3702
27.....	5 95	208	5 44	192	4 45	331	3 34	1131	3 97	1933	4 78	3290
28.....	5 95	208	5 44	192	4 43	337	3 37	1165	3 89	1822	4 65	3038
29.....	5 95	208			4 65	360	3 39	1188	3 80	1700	4 57	2891
30.....	5 95	208			4 55	351	3 28	1063	3 76	1648	4 57	2891
31.....	6 00	208			4 40	335			3 87	1794		

NOTES:—* Interpolated from Jan. 1st to April 17th ice conditions.



Headgates of Alberta Railway and Irrigation Company Canal at Kimball. Taken by F. H. Peters.



Gauging Station on A. R. & I. Co. Canal at Rolph Creek Flume. Taken by F. H. Peters.

DAILY GAUGE-HEIGHT AND DISCHARGE of St. Mary River at Kimball, for 1911.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4.47	2714	3.46	1272	2.91	684	3.25	1030	2.52	375	6 01	308
2	4.37	2547	3.42	1224	2.95	722	3.21	986	2.56	405	5 89	303
3	4.28	2404	3.41	1212	2.99	760	3.21	986	2.56	405	5 79	299
4	4.24	2342	3.36	1154	3.39	1188	3.18	954	2.56	405	5 85	301
5	4.22	2311	3.36	1154	4.07	2080	3.15	922	2.53	382	5 61	291
6	4.18	2249	3.36	1154	3.88	1808	3.11	880	2.51	368	5 42	282
7	4.17	2234	3.44	1248	3.77	1661	3.07	840	2.51	368	5 57	289
8	4.12	2156	3.38	1177	3.75	1635	2.99	760	4.48	351	5.59	290
9	4.07	2080	3.58	1420	3.65	1508	2.96	734	4.51	335	5.56	288
10	3.97	1933	3.56	1395	3.61	1458	2.96	734	4.48	319	.....	* 236
11	3.87	1794	3.41	1212	3.64	1495	2.93	704	4.59	303	.....	* 184
12	3.81	1714	3.41	1212	3.68	1545	2.96	734	5.52	286	1 50	132
13	3.76	1648	3.41	1212	3.71	1583	2.94	713	6.21	317	1 55	140
14	3.71	1583	3.34	1131	3.74	1622	3.00	770	6.35	324	1 55	140
15	3.74	1622	3.27	1052	3.65	1508	2.96	734	6.32	323	1.55	140
16	3.76	1648	3.28	1063	3.65	1508	2.91	684	6.30	322	1.60	149
17	3.84	1754	3.26	1041	3.58	1420	2.86	641	6.13	314	1 60	149
18	3.80	1700	3.20	975	3.56	1395	2.83	616	5.56	288	1 60	149
19	3.74	1622	3.21	986	3.51	1332	2.81	598	6.11	313	1 60	149
20	3.68	1545	3.21	986	3.45	1260	2.79	582	6.06	311	1.70	167
21	3.66	1520	3.26	1041	3.46	1272	2.77	566	6.01	309	1 80	185
22	3.64	1495	3.16	933	3.56	1395	2.78	574	5.90	303	1 55	140
23	3.66	1520	3.11	880	3.64	1495	2.77	566	5.82	300	1 55	140
24	3.66	1520	3.07	840	3.61	1458	2.77	566	5.76	297	2 38*	134
25	3.56	1395	3.04	810	3.58	1420	2.71	518	5.77	298	3.20	129
26	3.56	1395	3.05	820	3.48	1296	2.61	442	5.72	295	3.30	128
27	3.56	1395	3.06	830	3.46	1272	2.64	465	6.23	318	3.30	128
28	3.53	1358	3.01	780	3.49	1308	2.61	442	7.26	365	3.45	128
29	3.47	1284	2.97	744	3.36	1154	2.54	390	7.16	360	3.70	128
30	3.56	1395	2.96	734	3.29	1074	2.56	405	7.16	360	3.45	128
31	3.56	1395	2.91	684	..	..	2.57	412	.....	.....	3.58*	128

NOTES:—* Interpolated from Nov. 8 to Dec. 31 ice conditions.

MONTHLY DISCHARGE of St. Mary River at Kimball, for 1911.

(Drainage area 472 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
January	220	194	207	.44	507	12,937
February	214	167	190	.40	417	10,508
March.....	360	131	246	.41	473	12,034
April	1188	250	719	1.12	1,250	31,376
May	3839	1074	2456	4.38	5,050	127,249
June	4391	2388	3390	7.74	8,636	217,269
July	2714	1284	1999	3.77	4,346	109,630
August	1420	684	1052	2.21	2,548	64,217
September	2080	684	1382	2.92	3,258	81,949
October	1030	390	710	1.43	1,649	41,547
November.	405	286	346	.70	781	19,874
December.	308	128	218	.40	461	11,664
The year.						740,254

ALBERTA RAILWAY AND IRRIGATION COMPANY CANAL NEAR KIMBALL, ALTA.

This station was established July 26, 1910, by F. H. Peters. It is located at the flume over Rolph creek on the S. E.¼ Sec. 21, Tp. 2, Rge. 24, W. 4th Mer., It is by trail fifteen miles southeast of Cardston, and six miles northeast of Kimball.

The flume carries all the water delivered to the company's irrigation system. It is 768 feet long, 27 feet wide, and 6 feet high (inside dimensions) and is perfectly straight. It is built of smooth plank and has a fall of one hundredth of a foot in sixteen feet.

Discharge measurements are made from a small foot bridge spanning the flume at a point about midway from the ends. The initial point for soundings is the inside face of the left side of the left side of the flume.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to the side of the flume five feet downstream from the foot-bridge. The datum of the gauge is the bottom of bottom of the flume.

During 1911, the gauge was read by J. M. Dunn, ditch rider for the company. The commutator of the meter used in making most of the discharge measurements at this station in 1911 was accidentally broken and before it could be repaired the rating station was frozen up and the meter could not be rated. The records are, therefore, withheld until the meter is rated and the computations checked.

ROLPH CREEK NEAR KIMBALL, ALTA.

This station was established on May 17, 1911, by L. J. Gleeson. It is located at the Alberta Railway and Irrigation Company's flume, in Sec. 21, Tp. 2, Rge. 24, W. 4th Mer. It is six miles northeast of Kimball and fifteen miles southeast of Cardston.

The channel is straight for 200 feet above the station, and for 150 feet below. The bed is gravelly in character, and shifts during high water. Both banks are low and bare, and overflow at high stages. While passing under the flume the water is carried over an apron built to protect the piling from scour.

Discharge measurements are made by wading at or near the gauge.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the downstream side of the right-hand wing-wall. The zero (elev., 93.461) is referred to the sill of a trestle ten feet from the gauge (assumed elev., 100.00).

The gauge was read four times a week by J. M. Dunn. The records for this station, for 1911, will be completed during 1912 and published with the records for that year.

LEE CREEK AT CARDSTON, ALTA.

This station was established on June 28, 1909, by H. C. Ritchie. It is located at a foot-bridge in the eastern portion of the town of Cardston in the N.W. $\frac{1}{4}$ Sec. 10, Tp. 3, Rge. 25, W. 4th Mer.

The channel is straight for 100 feet above and 300 feet below the station. The bed of the stream is composed of gravel with a thin covering of soft mud. In high water the current is very swift, but in low water is comparatively slow. The right bank is of clay formation, high and not liable to overflow. The left is low, gravelly and overflows during high water.

On account of the constantly shifting character of the bed during periods of high water, measurements are made at the most suitable sections near the gauge. When the water is low, a section, 150 feet upstream from the footbridge, is used. The initial point of soundings is on the left bank and is marked with a stake driven into the left bank, close to the water's edge.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a pile near the east end of the foot-bridge. The zero (elev., 91.60) is referred to a permanent iron bench-mark (assumed elev., 100.00), situated on the right bank 100 feet upstream from the gauge.

During 1911, the gauge was read by Mr. Stirling Williams. The commutator of the meter used in making most of the discharge measurements at this station in 1911 was accidentally broken, and before it could be repaired the rating station was frozen up and the meter could not be rated. The records are, therefore, withheld until the meter is rated and the computations checked.

ST. MARY RIVER AT WHITNEY'S RANCHE, ALTA.

This station was established on October 13, 1911, by H. R. Carscallen. It is located on the N.E. $\frac{1}{4}$ Sec. 26, Tp. 7, Rge. 22, W. 4th Mer., near W. D. Whitney's house, and is about ten miles from Lethbridge post office.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to a post sunk in the bed of the river at the right bank. The zero of the gauge (elev., 87.55) is referred to a permanent iron bench-mark (assumed elev., 100.00) near Mr. Whitney's house.

The channel is straight for 900 feet above and 1,000 feet below the station. The right bank is low and may overflow during flood stage of the stream. The left bank is high, and will not overflow. The bed of the stream is composed of gravel and is not liable to shift.

Discharge measurements are made by means of a cable, car, tagged wire and stay wire. The initial point for soundings is a spike driven into the downstream sill of the tower on the left bank.

The gauge is read by W. D. Whitney. Tables of daily and monthly discharge for 1911 have not yet been computed. These will be finished during 1912 and published with the records for that year.



Cable Support and Fastenings at Station on North Branch of Milk River at Peters' Rancho.
Taken by F. H. Peters.

SESSIONAL PAPER No. 25d

DISCHARGE MEASUREMENTS of St. Mary River, at Whitney's Ranche, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Oct. 28.....	N. M. Sutherland.....	177.0	249.88	2.25	2.23	561.40x
Nov. 29.....	D. D. Macleod.....	190.0	214.40	1.40	2.43	297.84
Dec. 15.....	do.....	180.0	151.55	1.32	2.20	199.34

x Slush Ice.

MILK RIVER DRAINAGE BASIN.

General Description.

Milk River rises on the eastern slope of the foothills in the Blackfoot Indian reserve in the United States. Its head-waters run down in two main streams which are known, after entering Canada, as the north and south branches. The north branch runs in a northeasterly direction through the Blackfoot reserve for a distance of about fifteen miles and then enters Canada near the "quarter mound" on the south side of Section 3, Township 1, Range 23, west of the 4th Meridian. From the International Boundary the stream continues in a northeasterly direction for about nine miles, when it bends to the east and runs in an easterly direction through the second tier of townships to its junction with the south branch at the centre of Section 20, Township 2, Range 18, west of the 4th Meridian.

The south branch runs to the south and east of, and parallels, the north branch for a distance of about 48 miles, as the crow flies, through the Blackfoot reserve and then enters Canada near the "quarter mound" on the south side of Section 1, Township 1, Range 20, west of the 4th Meridian. From the International Boundary it runs in a northeasterly direction to its junction with the north branch. From the junction of the two branches Milk River runs in an easterly direction through the second tier of townships in Canada to the east boundary of Range 7. From this point the river runs in a southeasterly direction to its first point of crossing the International Boundary into the United States. This first point of crossing is near the "quarter mound" on the south side of Section 5, Township 1, Range 5, west of the 4th Meridian. From this point the river meanders in an easterly direction through Canada and United States to a point on the International Boundary about 900 feet west of the east boundary of Section 1, Township 1, Range 5, west of the 4th Meridian, where it finally crosses into the United States. This point is known as the "Eastern Crossing". The length of the course of Milk River in Canada from the western crossing of the north branch to the eastern crossing is 179 miles. The length of the course of the south branch in Canada is twenty miles.

Throughout its course in Canada from the western crossing of the north branch to the eastern crossing, Milk River runs through a well defined valley bordered on each side by a range of hills. The whole of its water-shed in Canada is bald prairie land. The river receives a number of small tributary creeks along its course, all of which discharge a considerable volume of water during the spring freshets; usually they all dry up by about July 1, and have no considerable discharge again until late in the fall, when some of them have a small flow for perhaps a month before the freeze-up.

The general conditions of flow in the river are such as are typical of all rivers which have a watershed devoid of tree growth; that is, it is subject to extreme floods during the freshet period and to correspondingly low flow during the summer months. From its head-waters to the eastern crossing the total area of the watershed of Milk River is 2,448 square miles. Of this total amount 1,645 square miles are in Canada and 803 square miles in the United States.

NORTH BRANCH OF MILK RIVER NEAR PETER'S RANCHE, ALTA.

This station was established by P. M. Sauder and F. H. Peters on July 21, 1909. It is located 150 feet upstream from the north boundary of the N.E $\frac{1}{4}$ Sec. 13, Tp. 1, Rge. 23, W. 4th. Mer. It is seven miles by trail from Taylorville post office and fifteen miles from Kimball.

The stream flows in one channel, which is about forty feet wide at ordinary stages. It is straight for about 200 feet above the station and is almost straight for about 300 feet below. Both banks are composed of solid clay. The right is high and not liable to overflow, but the left may overflow at extreme flood stage of the stream. The bed of the stream is composed of a layer of soft mud and stones over a solid clay foundation.

Discharge measurements are made during high water by means of a cable, car, tagged wire, and stay wire. The initial point for soundings is the face of a post on the left bank. At low water the discharge is measured by wading at a point about one quarter of a mile downstream from the cable.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the left bank. The zero (elev., 86.87) is referred to a permanent iron bench-mark (assumed elev., 100.00), situated on the left bank, directly beneath the turn-buckle on the cable.

During 1911, the gauge was read by Bert Mecham from April 19 to September 25, and by Wm. Wheeler from September 25 to November 2nd.

The commutator of the meter used in making most of the discharge measurements at this station during 1911 was accidentally broken, and before it could be repaired the rating station was frozen and the meter could not be rated. The records are, therefore, withheld until the meter is rated and the computations checked.

NORTH BRANCH MILK RIVER AT KNIGHT'S RANCHE, ALTA.

This station was established by F. H. Peters and P. M. Sauder on July 17, 1909. It is located in Sec. 18, Tp. 2, Rge. 20, W. 4th Mer., almost directly south of the Knight Sugar Company's Horse-shoe Ranche buildings. It is about 36 miles by trail from Milk River station.

The stream flows in one channel about 44 feet wide at ordinary stages. It is straight for about 150 feet above and 100 feet below the station. The right bank is composed of clay, is high and not liable to overflow. The left bank is composed of light sandy loam, is low and liable to overflow to quite a distance, during high stages of the stream. The bed of the stream is composed of mud, gravel and boulders.

Discharge measurements are made by means of a cable, car, tagged wire and stay wire. The initial point for soundings is the face of a cedar post on the right bank. Discharge measurements can be made by wading during low water.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the right bank. The zero (elev., 97.70) is referred to a permanent iron bench-mark (assumed elev., 100.00), situated close to the initial point for soundings. As an observer could not be secured the gauge was not read during 1911.

The commutator of the meter used in making the discharge measurements at this station in 1911 was accidentally broken, and before it could be repaired the rating station was frozen up and the meter could not be rated or the computations checked.

NORTH BRANCH OF MILK RIVER NEAR MACKIE'S RANCHE, ALTA.

This station was established July 16, 1909, by P. M. Sauder and F. H. Peters. It is located on the S.W. ¼ Sec. 19, Tp. 2, Rge. 18, W. 4th Mer. It is seventeen miles by trail from Milk River, three miles north of the Mackie ranche buildings, and one mile west of the junction of the north and south branches.

The stream flows in one channel which at ordinary stages is about 60 feet wide. It is straight for 200 feet above and about 150 feet below the station. Both banks are low and liable to overflow at high stages. The bed of the stream is composed of gravel and is constantly changing.

Discharge measurements are made by means of a cable, car, tagged wire, and stay wire. The initial point for soundings is the face of a cedar post planted in the north bank and marked "O+OO".

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the right bank. The zero (elev., 91.50) is referred to a permanent iron bench-mark (assumed elev., 100.00), located 25 feet from the edge of the right bank, and under the cable.

As it was impossible to secure an observer the gauge was not read during 1911.

DISCHARGE MEASUREMENTS of North Branch of Milk River near Mackie's Ranche, Alta., in 1911.

Date.	Hydrographer.	Width	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 19	L. G. Gleeson	60.0	85.55	0.86	2.16	73.57
May 4	do	59.6	79.30	0.72	2.01	56.96
May 12	do	60.4	75.00	0.63	1.95	47.60
May 21	J. E. Degnan	59.0	55.21	0.88	2.11	48.63
June 10	do	61.0	82.67	1.22	2.50	101.44
July 1	do	57.0	47.40	0.74	1.96	35.34
Aug. 3	do	60.0	49.83	0.71	1.94	35.56
Aug. 29	do	61.0	50.25	0.64	1.92	32.14
Oct. 17	do	61.0	68.24	0.73	2.06	50.95

SOUTH BRANCH OF MILK RIVER AT MACKIE'S RANCHE, ALTA.

This station was established July 14, 1909, by P. M. Sauder and F. H. Peters. It is seventeen miles by trail from Milk River and is located on the N.W. ¼ Sec. 31, Tp. 1, Rge. 18, W.

SESSIONAL PAPER No. 25d

4th Mer., about one quarter of a mile upstream from Mackie Bros' ranche buildings, and is about five miles upstream from the junction of the north and south branches of Milk River.

The stream flows in one channel and is straight for about 150 feet above the station and for 100 feet below. The right bank is composed of sand and gravel and is liable to overflow. The left bank is composed of clay and is high. The bed of the stream consists of gravel and sand and is liable to shift.

Discharge measurements are made during high stages by means of a cable, car, tagged wire, and stay wire, and at low stages by wading. The initial point for soundings is the face of a cedar post planted in the left bank.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the left bank. The zero of the gauge (elev., 86.60) is referred to a permanent iron bench-mark (assumed elev., 100.00) located on the left bank, directly under the cable and five feet from the initial point of soundings.

During 1911, the gauge was read by Mrs. F. Cathro.

DISCHARGE MEASUREMENTS of South Branch of Milk River at Mackie's Ranche, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 18.....	L. J. Gleason.....	87.8	119.12	1.760	3.16	210.65
May 5.....	do.....	88.2	119.20	1.730	3.10	206.40
May 12.....	do.....	80.8	110.00	1.620	2.96	178.70
May 20.....	J. E. Degnan.....	89.0	148.55	2.031	3.40	301.75
June 9.....	do.....	88.0	131.25	1.470	3.14	194.02
July 1.....	do.....	88.0	137.80	1.629	3.26	224.39
Aug. 1.....	do.....	85.0	83.50	0.998	2.60	83.41
Aug. 4.....	do.....	85.0	79.06	0.948	2.55	75.00
Aug. 28.....	do.....	63.5	48.92	0.698	2.21	34.12
Oct. 16.....	do.....	84.0	71.42	0.876	2.46	62.67

DAILY GAUGE-HEIGHT AND DISCHARGE of South Branch of Milk River at Mackie's Ranche, Alta., for 1911.

Day.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.]
1.....					3.10	204	3.15	196
2.....					3.09	202	3.15	196
3.....					3.09	203	3.15	196
4.....					3.05	193	3.10	184
5.....					3.05	193	3.05	172
6.....					3.05	193	3.15	196
7.....					3.07	199	3.10	184
8.....					3.07	201	3.10	184
9.....					3.05	198	3.15	196
10.....					3.07	204	3.10	184
11.....					3.07	205	3.10	184
12.....					2.87	158	3.15	196
13.....					3.05	202	3.15	196
14.....					3.15	228	3.00	160
15.....					3.60	365	2.79	116
16.....					4.41	660	2.79	116
17.....			3.11	198	5.05	961	2.83	124
18.....			3.20	224	3.79	426	2.80	118
19.....			3.40	281	3.50	333	2.80	118
20.....			3.19	221	3.40	301	2.79	116
21.....	5.05		3.39	279	3.25	255	2.79	116
22.....	6.20		3.40	283	3.25	250	2.73	105
23.....			3.59	341	3.25	246	2.70	100
24.....			3.39	281	3.25	243	3.32	242
25.....			3.29	253	3.20	226	5.21	982
26.....			3.29	253	3.25	237	4.95	853
27.....			3.29	255	3.39	273	4.41	613
28.....			3.40	287	3.39	269	4.51	653
29.....			3.30	258	3.36	258	3.72	363
30.....			3.09	202	3.30	237	3.37	257
31.....					3.20	209		

DAILY GAUGE-HEIGHT AND DIS-CHARGE of South Branch of Milk River at Mackie's Ranche, Alta., for 1911.—Continued.

DAY.	July		August.		September.		October.		November.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	3.25†	223	2.54	74	2.21	34	2.59	82	2.60	83
2.	3.23	217	2.59	82	2.24	37	2.54	74	2.61	85
3.	3.23	217	2.46	63	2.35	49	1.55	76	2.60	83
4.	3.10	184	2.55	76	2.40	55	2.59	82	2.63*	83
5.	3.09	182	2.56	77	2.55	76	2.65	92	2.65	
6.	2.90	138	2.58	80	3.86‡	408	2.68	97	2.69	
7.	2.86	130	2.55	76	3.97	446	2.64	90	2.65	
8.	2.70	100	2.49	67	3.67	348	2.63	88	2.63	
9.	2.69	98	2.39	54	3.60	326	2.60	83	2.50	
10.	2.66	93	2.38	53	3.40	265	2.58	80	2.40	
11.	2.60	83	2.40	55	3.21	212	2.57	78	2.35	
12.	2.50	68	2.40	55	3.02	165	2.59	82	2.37	
13.	2.46	63	2.45	62	2.90	138	2.55	76	2.38	
14.	2.41	56	2.46	63	2.81	120	2.55	76	2.37	
15.	2.39	54	2.45	62	2.74	107	2.54	74	2.36	
16.	2.41	56	2.44	60	2.70	100	1.46	63	2.37	
17.	2.41	56	2.43	59	2.75	109	2.45	62		
18.	2.44	60	2.41	56	2.73	105	2.44	60		
19.	2.45	62	2.41	56	2.69	98	2.44	60		
20.	2.45	62	2.41	56	2.66	93	2.43	59		
21.	2.44	60	2.24	37	2.65	92	2.43	59		
22.	2.43	59	2.26	39	2.59	82	2.45	62		
23.	2.42	58	2.21	34	2.55	76	2.44	60		
24.	2.42	58	2.26	39	2.69	98	2.47	64		
25.	2.38	53	2.16	30	2.75	109	2.48	65		
26.	2.36	50	2.15	29	2.70	100	2.50	68		
27.	2.34	48	2.15	29	2.71	102	2.53	72		
28.	2.33	47	2.21	34	2.69	98	2.56	77		
29.	2.33	47	2.19	32	2.68	97	2.58	80		
30.	2.31	44	2.24	37	2.66	93	2.57	78		
31.	2.42	58	2.22	35			2.58	80		

NOTE—The ice started to break up on March 21, and the following day the gauge was carried out. It was re-established on April 17.
‡ Lowered the gauge one foot.
* Ice covered after Nov. 4.

MONTHLY DISCHARGE of South Branch of Milk River at Mackie's Ranche, Alta., for 1911.

Drainage area, 441 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
April (17-30)	341	198	258	0.585	0.30	7,172
May	961	158	275	0.624	0.72	16,909
June.....	982	100	254	0.576	0.64	15,114
July.....	223	44	90	0.204	0.24	5,534
August.....	82	29	54	0.122	0.14	3,320
September.....	446	34	141	0.320	0.36	8,390
October.....	97	59	74	0.168	0.19	4,550
November (1-3)	85	83	84	0.190	0.01	550
The period.....						61,539

MILK RIVER AT MILK RIVER, ALTA.

This station was established by H. C. Ritchie on May 18, 1909, and re-established by F. H. Petres on July 3, 1909. It is located on the N.E. ¼ Sec. 21, Tp. 2, Rge. 16, W. 4th Mer., at the A. R. and I. railway bridge, one quarter of a mile south of the town of Milk River.

The stream flows in one channel at all stages and in ordinary stages is not more than 140 feet wide. The channel is almost straight for 300 feet above and below the station. The right bank is sandy, fairly high, and not liable to overflow. The left bank is lower and overflows during high water. The bed of the stream is composed of sand and fine gravel, which is constantly shifting.

Discharge measurements are made from the downstream side of the bridge at high water and in low water a wading section, about 50 feet upstream, is used.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to an old bridge-pile about twelve feet above the present bridge. As this gauge is liable to be carried out by ice or flood-water, a chain-gauge has been attached to the bridge and will be read if the staff goes out. The datum of the chain-gauge is the same as that of the staff. The zero of both gauges (elev., 90.97) is referred to a permanent iron bench-mark (assumed elev., 100.00), located on the left bank, twenty feet upstream from the bridge and thirty feet back from the bank.

During 1911, the gauge was read by Dan. O'Connell.

DISCHARGE MEASURMENTS of Milk River at Milk River, Alta., in 1911.

Date.	Hydrographer	Width	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 14.....	L. J. Gleeson.....	130.4	160.51	1 610	2 04	258.60
May 2.....	N. McL. Sutherland.	128.5	141.08	1 590	1 85	223.81
May 7.....	L. J. Gleeson.....	142.3	186.30	1 920	2 26	358.65
May 17.....	N. McL. Sutherland.	76 0	484.14	3 500	4 72	1,692.23*
May 22.....	J. E. Degnan.....	129.0	157.40	1 676	2 10	263.82
June 13.....	do ..	128.0	113.83	1 420	1 70	162.00
June 28.....	do ..	132.5	245.10	2 090	2 70	512.00
July 5.....	do ..	128.5	120.80	1 452	1 74	175.45
July 29.....	do ..	112.0	69.82	1 076	1 20	75.12
Aug. 10.....	do ..	129.5	128.58	1 342	1 73	172.60
Aug. 30.....	do ..	113.0	67.47	0 989	1 22	66.78
Sept. 7.....	do ..	130.0	294.50	2 660	3 24	783.48*
Sept. 8.....	do ..	127.0	269.11	2 480	2 88	667.15*
Sept. 9.....	do ..	125.0	259.15	2 481	2 83	643.38*
Sept. 15.....	do ..	129.0	102.04	1 447	1 63	147.70
Oct. 14.....	do ..	127.0	83.75	1 356	1 53	113.58
Oct. 20.....	do ..	128.0	85.82	1 317	1 53	112.48
Nov. 10.....	L. J. Gleeson and D. D. Macleod...	*84.0	45.19	1 520	1 45	68.59
Dec. 7.....	D. D. MacLeod...	*84.0	10.67	1 180	2 28	119.80‡
Dec. 29.....	do	*75.0	53.35	0 900	2 25	47.97‡

* Measurement not taken at regular stations, waded at a better cross-section. ‡Ice conditions.

DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River at Milk River, Alta., for 1911.

Day.	April.		May.		June.		July.	
	Gauge Height	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	2 51	426	1 87	228	2 01	244	2 45	401
2	1 95	227	1 85	224	1 97	233	2 36	365
3	1 95	227	1 85	224	1 94	224	2 10	272
4	1 85*	200	1 85	224	2 00	241	1 97	233
5	1 65*	162	2 00	267	1 94	224	1 75	176
6	1 85*	200	2 11	303	1 90	213	1 70	164
7	1 45	111	2 16	321	1 88	208	1 62	146
8	1 85	200	2 26	358	1 85	200	1 50	120
9	1 85	200	1 96	255	1 76	178	1 53	126
10	1 85	200	1 95	252	2 03	250	1 46	112
11	2 69	507	1 95	252	1 85	200	1 41	103
12	2 45	402	1 91	240	1 74	174	1 39	99
13	2 15	288	1 90	237	1 68	159	1 37	96
14	2 04	253	1 91	240	1 65	152	1 34	90
15	1 96	230	2 60	501	1 61	143	1 31	85
16	1 86	204	4 12	1,326	1 56	133	1 30	83
17	1 96	232	5 00	1,884	1 57	135	1 30	83
18	2 01	249	3 10	710	1 54	128	1 29	82
19	2 16	299	2 72	521	1 50	120	1 40	101
20	2 10	282	2 50	422	1 42	105	1 50	120
21	2 20	318	2 10	272	1 40	101	1 44	109
22	2 60	485	2 10	272	1 50	120	1 39	99
23	2 81	589	2 10	272	1 60	141	1 36	94
24	2 51	449	2 18	298	2 04	253	1 32	87
25	2 31	368	2 19	301	5 09	945	1 32	87
26	2 51	454	2 22	312	5 24	2,049	1 34	90
27	2 51	457	2 36	365	3 78	1,090	1 30	83
28	2 41	414	2 30	342	2 65	489	1 20	69
29	2 21	338	2 32	350	2 50	422	1 20	69
30	2 00	265	2 15	288	2 42	389	1 20	69
31	....	...	2 02	247	....	...	1 19	68

SESSIONAL PAPER No 25d.

DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River at Milk River, Alta., for 1911.—*Con.*

Day.	August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge	Gauge Height	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.
1.....	1.34	90	1 10	56	1 58	131	1.70	147	2.28	121
2.....	1.51	122	1.05	50	1 55	125	1.75	159	2.27	120
3.....	1.41	193	1.14	61	1 55	125	1 80	171	2.30	125
4.....	1.46	112	1 50	120	1 65	144	1 85	184	2 30	124
5.....	1.45	110	2 50	422	1 78	172	1.95	208	2.30	122
6.....	1 47	114	3 50	927	1 71	156	1.95	205	2 28	121
7.....	1.62	146	3 50	927	1 65	142	1 80	169	2.28	120
8.....	1 75	176	3 00	730	1 60	131	1 50	95	2.28	120
9.....	1 71	166	2 85	653	1 56	123	1 50	85	2.28	119
10.....	1 65	152	2 40	427	1 55	120	1.45	69	2.23	115
11.....	1.53	126	2 10	303	1 53	116	1 70†	81	2.20	112
12.....	1 50	120	1 91	236	1 52	112	1 70	80	2.15	97
13.....	1 46	112	1 80	200	1 52	112	1 70	81	2.00	67
14.....	1 40	101	1 66	160	1 53	112	1 75	84	2 00	65
15.....	1 31	85	1 63	148	1 57	120	1 90	93	2 00	64
16.....	1 26	77	1 52	123	1 50	107	2 15‡	111	2.10	68
17.....	1 21	70	1 56	131	1 48	103	2 40	136	2.10	66
18.....	1 18	66	1 58	135	1 50	107	2 35	132	2.10	62
19.....	1 10	56	1 65	150	1 50	107	2 30	128	2.08	60
20.....	1 10	56	1 60	138	1 50	107	2 25	123	2.03	53
21.....	1 10	56	1 57	131	1 51	109	2 25	121	2.00	47
22.....	1 10	56	1 58	134	1 50	107	2 25	122	2.02	47
23.....	1 10	56	1 59	138	1 53	112	2 25‡	120	2.02	48
24.....	1 10	56	1 66	149	1 50	107	2 30	122	2.02	45
25.....	1 15	62	1 68	153	1 50	107	2 30	121	2.05	47
26.....	1 14	61	1 77	172	1 40	89	2 37	128	2.05	46
27.....	1 15	62	1 78	177	1 30	73	2 37	126	2 00	47
28.....	1 15	62	1 68	152	1 55	116	2 35	125	2.20	51
29.....	1 18	66	1 60	134	1 60	125	2 35	123	2.25	48
30.....	1 20	69	1 59	132	1 65	136	2 28	122	2 25	47
31.....	1 15	62			1 70	147			2.28	49

* Ice on river. † Ice conditions after Nov. 10th.
‡ Water was running over the ice from Nov. 16th to 23 (inc.)
Note—Discharge for Gauge-heights over 5.00 only approximate. Daily discharges for Nov. and Dec. are only approximate.

MONTHLY DISCHARGE of Milk River at Milk River, Alta., for 1911

Drainage area, 1,077 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
April.....	589	111	308	0.286	0.32	18,327
May.....	1,884	224	399	0.370	0.43	24,534
June.....	2,049	101	355	0.329	0.37	21,124
July.....	401	68	128	0 119	0.14	7,870
August.....	176	56	91.2	0 085	0.10	5,607
September.....	927	50	252	0.234	0.26	14,995
October.....	172	73	119	0.110	0.13	7,317
November.....	208	69	126	0.118	0.13	7,498
December.....	125	45	79	0.073	0.08	4,858
The period.....						112,130

MILK-RIVER AT WRITING-ON-STONE POLICE DETACHMENT, ALTA.

This station was established on August 2, 1909, by F. H. Peters. It is located at Writing-on-stone R. N. W. M. P. detachment, in the S.W. ¼ Sec. 35, Tp. 1, Rge. 13, W. 4th Mer. It is 17 miles by trail from Coutts and 25 miles from Milk River station.

The river flows in one channel at all stages. It is straight for 300 feet above and 250 feet below the station. Both banks are slightly wooded, high and not liable to overflow except in extreme flood stages of the stream. The bed of the stream is composed of sand, which is constantly shifting.

Discharge measurements are made during high water by means of a cable, car, tagged wire and stay wire, and at low stages by wading. The initial point for soundings is 50 feet south of a post on the right bank, marked "†50".

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the right bank. The zero (elev., 86.13) is referred to a permanent iron bench-mark (assumed elev., 100.00), located on the right bank directly under the cable and one foot north of the tower.

During 1911, the gauge was read by constable A. P. White.

DISCHARGE MEASUREMENTS of Milk River, at Writing-on-Stone Police Detachment, in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 17.....	N. McL. Sutherland.....	66.0	114.53	2.04	2.52	233.84
May 4.....	do	74.7	97.11	2.17	2.36	211.32*
May 14.....	do	81.7	111.46	2.11	2.47	234.40*
May 24.....	J. E. Degnan.....	86.0	150.64	2.10	2.85	316.86*
June 6.....	do	87.0	123.76	1.73	2.45	214.60*
June 16.....	do	88.7	93.80	1.55	2.21	145.17*
July 7.....	do	68.5	97.90	1.78	2.36	174.56*
July 25.....	do	46.0	63.27	1.49	1.94	94.50
Aug. 11.....	do	61.0	97.73	1.83	2.34	178.82
Aug. 21.....	do	49.0	54.17	1.07	1.67	58.19
Sept. 2.....	do	48.0	44.25	1.20	1.66	53.05
Sept. 12.....	do	88.0	148.58	1.87	2.70	277.38*
Sept. 18.....	do	63.0	80.79	1.62	2.13	130.98*
Oct. 4.....	do	80.0	102.18	1.41	2.21	143.98*
Oct. 23.....	do	77.0	83.93	1.47	2.09	122.94*
Nov. 7.....	do	75.0	98.85	1.27	2.25	125.75*

* Measurement not taken at regular station.

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River at Writing-on-Stone Police Detachment, Alta., for 1911.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.89	.....	2.31	..	x	..	3.17	458	2.39	210	2.69	278
2.....	1.78	.....	2.35	..	2.82	...	3.05	412	2.36	201	2.53	232
3.....	x	.....	2.38	..	2.84	...	2.73	300	2.39	218	2.49	223
4.....	x	.....	2.43	..	2.81	...	2.49	226	*2.44	233	2.46	216
5.....	1.91	.....	2.45	.....	2.83	...	1.96	108	*2.49	247	2.44	271
6.....	1.95	..	2.52	..	2.87	...	2.26	120	2.54	263	2.45	215
7.....	2.05	.....	2.51	..	2.82	...	2.33	186	2.63	289	2.44	211
8.....	2.00	.....	2.50	..	2.79	.....	2.50	229	2.86	366	2.37	193
9.....	1.94	.....	2.55	..	2.80	.....	2.38	197	2.88	372	2.30	175
10.....	1.88	.....	2.55	..	2.82	...	2.55	244	2.64	291	2.32	179
11.....	1.78	.....	2.57	.....	2.76	..	2.76	309	2.45	233	2.60	252
12.....	1.70	..	2.57	.....	2.73	..	3.23	482	2.51	250	2.32	177
13.....	1.65	.....	2.60	..	2.90	.....	2.94	372	2.46	234	2.25	159
14.....	1.60	.....	2.64	.....	2.88	..	2.69	287	2.50	245	2.24	157
15.....	1.57	.....	2.77	..	3.06	.....	2.59	256	2.57	262	2.22*	150
16.....	1.61	.....	2.79	.....	2.85	.....	2.54	241	3.33	532	2.19*	141
17.....	1.69	.....	2.77	.....	2.99	..	2.49	226	4.60	1,128	2.16	136
18.....	1.78	.....	2.74	.....	3.05	.....	2.56	248	4.31	969	2.15	134
19.....	1.80	.....	2.78	.....	2.90	.....	2.61	264	3.61	636	2.11	126
20.....	1.79	.....	2.85	.....	2.83	.....	2.75	307	3.28	494	2.08	120
21.....	x	.....	2.89	..	2.78	.....	2.64	274	3.02	391	2.02	109
22.....	1.82	.....	2.91	..	4.52	.....	2.82	335	2.80	312	2.34	175
23.....	1.72	.....	2.93	.....	3.71	683	3.10	439	2.79	305	2.05	114
24.....	1.67	.....	2.75	.....	3.50	593	3.22	489	2.84	318	2.76	291
25.....	1.72	.....	2.75	.....	3.39	547	3.03	418	2.89	335	3.50	569
26.....	1.85	.....	2.78	.....	3.34	526	2.87	362	2.91	342	6.20	2,068
27.....	1.89	.....	2.81	.....	3.21	474	2.96	395	2.98	367	4.76	1,179
28.....	1.95	..	2.80	..	3.02	401	3.11	451	3.82	384	3.94	761
29.....	1.96	.....	..	.....	2.93	369	2.93	385	2.93	352	3.52	577
30.....	2.04	.....	..	.....	2.88	351	2.81	345	2.98	371	3.31	492
31.....	2.03	.....	...	.....	2.92	365	...	...	2.89	342	.....	.....

DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River at Writing-on-Stone Police Detachment, Alta., for 1911.—Continued.

Day.	July.		August.		September.		October.		November.	
	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3 37	516	1 95	97	1 76	68	2 23	150	2 40	189
2.....	3 12	418	1 99	103	1 82	77	2 24	152	2 08	120
3.....	3 12	418	2 05	114	2 06	116	2 25	154	2 23*	150
4.....	2 86	324	2 03	111	2 57	233	2 22	148	2 39	187
5.....	2 70*	272	2 01	107	2 56	230	2 26	157	2 35	177
6.....	2 54	224	2 08	120	3 65	631	2 32	170	2 34	175
7.....	2 38	181	2 25	154	4 08	827	2 26	157	....	....
8.....	2 29	163	2 39	187	3 80	697	2 26	157	....	....
9.....	2 23	150	2 36	179	3 49	565	2 28	154	....	....
10.....	2 16	136	2 39	187	3 33	500	2 23	150	....	....
11.....	2 15	131	2 30	165	3 04	388	2 23	150	....	....
12.....	2 14	132	2 20	144	2 66	260	2 20	144	....	....
13.....	2 10	124	2 14	132	2 48	208	2 17	138	....	....
14.....	2 08	120	2 06	116	2 30	165	2 15	134	....	....
15.....	2 04	113	1 99	103	2 22	148	2 14	132	....	....
16.....	2 00	105	1 95	97	2 10	124	2 12	128	....	....
17.....	1 96	99	1 91	91	2 10	124	2 10	124	....	....
18.....	1 95	97	1 82	77	2 15	134	2 12	128	....	....
19.....	1 95	97	1 75	67	2 14	132	2 10	124	....	....
20.....	1 97	100	1 69	59	2 16	136	2 10	124	....	....
21.....	1 96	99	1 68	57	2 20	144	2 10	124	....	....
22.....	1 98	102	1 66	55	2 23	150	2 10	124	....	....
23.....	2 00	105	1 60	47	2 19	142	2 10	124	....	....
24.....	2 00	105	1 57	43	2 22	148	2 15	134	....	....
25.....	2 00	105	1 55	41	2 24	152	2 12	128	....	....
26.....	2 00	105	1 56	42	2 26	157	2 10	124	....	....
27.....	2 00	105	1 61	48	2 29	163	2 10	124	....	....
28.....	1 94	95	1 66	55	2 33	172	2 02	109	....	....
29.....	1 89	88	1 68	57	2 28	161	1 68	57	....	....
30.....	1 84	80	1 70	60	2 25	154	1 87	84	....	....
31.....	1 83	78	1 71	61	..	...	2 20	144	....	....

x Observer absent.
* No observation, gauge height interpolated.

NOTE—Gauge was read during January, February and March, but the stream was frozen over, and as no discharge measurements were made during that period the daily discharges could not be computed. All gauge heights after March 23 have been reduced to 12 o'clock noon. Discharges for gauge heights over 3.00 are estimated.

MONTHLY DISCHARGE of Milk River, near Writing-on-Stone Police Detachment, for 1911.

Drainage area, 1,620 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet.
March (23-31)	683	351	479	0.308	0.10	8,551
April.....	489	108	317	0.196	0.22	18,863
May.....	1,128	209	371	0.229	0.26	22,812
June.....	2,068	109	334	0.206	0.23	19,874
July.....	516	78	161	0.099	0.11	9,900
August.....	187	41	96	0.059	0.07	5,903
September	827	68	244	0.150	0.17	11,519
October.....	170	57	134	0.083	0.10	8,239
November (1-6)	189	120	166	0.102	0.02	1,975
The period.....						110,636



View on Milk River near Pendant d'Oreille Police Detachment. Taken by F. H. Peters.

MILK RIVER AT PENDANT D'OREILLE POLICE DETACHMENT, ALTA.

This station was established by F. H. Peters on August 5, 1909. It is located 300 feet upstream from the buildings of the police post, on the S.W. 1/4 Sec. 21, Tp. 2, Rge. 8, W. 4th Mer., and is about 61 miles by trail from Milk River station.

The river flows in one channel which at ordinary stages is about 150 feet wide. It is straight for about 400 feet above and 300 feet below the station. The right bank is low, covered with small willows, and liable to overflow at high stages. The left bank is high, almost clear and not liable to overflow. The bed of the stream is composed of sand and is constantly changing.

Discharge measurements are made during high water by a means of a cable, car, tagged wire, and stay wire, and at low stages by wading. The initial point for soundings is the face of a cedar post on the left bank.

The gauge, which is a plain staff graduated to feet and hundredths, is at the left bank, about 80 feet downstream from the cable. The zero (elev., 82.45) is referred to a permanent iron bench-mark (assumed elev., 100.00), located directly under the cable, about five feet from the tower on the left bank.

During 1911, the gauge was read by Corporal T. B. Caulkin.

DISCHARGE MEASUREMENTS of Milk River at Pendant d'Oreille Police Detachment, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 19	N. McL. Sutherland	147.6	131.34	1.840	3.03	244.19
April 25	do	173.7	245.97	2.040	3.63	501.51
May 7	do	163.2	164.82	1.400	3.08	231.34
May 12	do .....	.....	.....	.....	3.15	231.21
May 29	J. E. Degnan.....	140.0	199.94	1.990	3.55	397.87
June 3	do	120.5	150.13	1.590	3.21	238.87
June 18	do	113.5	93.87	1.540	2.78	133.51
June 23	do	118.0	100.74	1.500	2.84	152.06
July 12	do	87.0	91.21	1.690	2.93	153.99*
July 21.	do	62.0	64.87	1.570	2.75	102.17*
Aug. 12	do	159.5	127.68	1.374	3.06	175.50
Aug. 17	do	158.0	99.56	1.040	2.77	103.62
Sept. 24.	do	119.0	116.02	1.750	3.13	203.12
Oct. 1.	do	132.0	113.16	1.589	3.07	179.83
Oct. 27	do	146.5	114.97	1.110	2.95	128.24
Nov. 3.	do	147.5	142.15	0.979	3.125	139.33

* Discharge measured by wading at a point down stream from the gauge

DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River at Pendant d'Oreille Police Detachment, Alta., in 1911.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2 90		■		2 34		3 57	516	3 46	412	3 48	362
2.....	2 90		*		*		3 80	638	3 33	345	3 30	274
3.....	2 90		2 50		2 37		3 46	458	3 26	311	3 26	286
4.....	*		2 50		2 40		3 12	286	3 14	257	3 27	265
5.....	*		2 53		2 45		2 78	155	3 05	219	3 25	259
6.....	2 85		2 55		2 50		2 96	216	3 03	211	3 25	262
7.....	2 85		2 55		*		3 11	282	3 07	227	3 19	240
8.....	2 83		2 52		*		3 05	254	3 07	221	3 11	212
9.....	2 83		2 55		3 00		3 05	254	3 36	345	3 08	201
10.....	2 83		2 57		3 10		2 97	220	3 38	352	3 00	176
11.....	*		2 63		3 34		3 03	246	3 20	258	3 04	194
12.....	*		2 60		3 04		3 36	406	3 20	254	3 06	205
13.....	2 85		2 57		3 05		3 76	617	3 19	246	3 02	195
14.....	2 85		*		2 95		3 41	431	3 17	236	2 98	181
15.....	2 80		*		2 87		3 21	329	3 21	252	2 94	169
16.....	2 77		2 00		2 90		3 09	272	3 36	320	2 90	160
17.....	2 75		1 97		2 91		3 05	254	4 22	774	2 86	151
18.....	2 73		1 80		2 86		3 05	254	4 83	1,118	2 81	140
19.....	2 68		1 78		2 85		3 03	246	4 38	859	2 77	130
20.....	2 68		2 00		3 01		3 09	261	3 93	612	2 76	132
21.....	2 66		2 00		3 25		3 23	317	3 74	506	2 79	139
22.....	2 65		2 17		3 31		3 17	277	3 60	434	2 79	139
23.....	2 65		2 24		4 17		3 45	412	3 44	350	2 80	142
24.....	2 55		2 25		4 00		3 58	478	3 38	318	4 02	719
25.....	2 56		2 37		3 95		3 63	501	3 41	331	3 97	688
26.....	2 48		2 25		4 04		3 57	469	3 44	346	5 63	1,541
27.....	2 47		2 27		4 02		3 48	422	3 45	347	5 10	1,331
28.....	2 40		2 30		*		3 62	496	3 48	362	4 56	1,014
29.....	2 33				*		3 65	512	3 53	388	4 30	863
30.....	2 35				*		3 61	490	3 54	393	4 01	702
31.....	*				4 00				3 56	403		

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River at Pendant d'Oreille Police Detachment, Alta., for 1911.—Continued.

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec. ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.67	1,069	2.58	76	2.51	67	3.08	184	2.97	114
2.....	4.23	817	2.66	88	2.50†	66	3.10	191	3.00	116
3.....	3.83	600	2.65	86	2.51†	67	3.42	327	3.15	147
4.....	3.73	543	2.69	92	4.07†	673	3.39	309	3.17	153
5.....	3.49	414	2.74	101	4.74	1,047	3.30	268	3.15	147
6.....	3.39	356	2.81	113	5.02	1,210	3.30	266	3.13	142
7.....	3.26	289	3.05	174	4.83	1,098	3.28	257	3.10	134
8.....	3.19	255	3.06	178	4.55	938	3.23	236	3.08	129
9.....	3.09	213	3.08	184	4.41	860	3.19	219	†	
10.....	3.04	194	3.09	188	4.38	843	3.14	197		
11.....	3.00	178	3.07	181	4.18	732	3.12	190		
12.....	2.95	159	3.05	174	3.98	623	3.09	177		
13.....	2.85	132	3.01	161	3.76	507	3.08	174		
14.....	2.83	129	2.97	159	3.49	337	3.05	163		
15.....	2.83	126	2.98	153	3.36	302	3.03	157	....
16.....	2.76	111	2.96	148	3.26	256	3.03	166	....
17.....	2.69	98	2.82	115	3.22	239	3.01	151		
18.....	2.70	97	2.70	94	3.16	214	3.00	147		
19.....	2.71	99	2.67	89	3.13	203	2.99	144		
20.....	2.73	101	2.63	84	3.12	199	2.98	139		
21.....	2.73	99	2.60	79	3.10	191	2.98	139		
22.....	2.77	106	2.59	78	3.12	199	2.98	138		
23.....	2.80	111	2.57	75	3.16	214	2.99	140		
24.....	2.79	109	2.57	75	3.05	174	2.98	136		
25.....	2.77	106	2.56	74	3.05	174	2.97	135		
26.....	2.74	101	2.56	74	3.08	184	2.97	133		
27.....	2.72	97	2.58	76	3.16	214	2.95	128		
28.....	2.69	92	2.57	75	3.20	230	2.94	122		
29.....	2.66	88	2.56	74	3.18	222	2.92	115		
30.....	2.63	84	2.54	71	3.14	207	2.94	115		
31.....	2.61	80	2.53	70			2.96	115		

NOTE—Gauge was read during January, February, and March, but the stream was frozen over and as no discharge measurements were made during that period the daily discharge could not be computed. All gauge heights have been reduced to 12 o'clock noon. Discharges for gauge heights over 3.80 are estimated.

- * Observer away.
- † River frozen over, observations discontinued.
- ‡ No observation, gauge height interpolated.

MONTHLY DISCHARGE of Milk River at Pendant d'Oreille Police Detachment, Alta., for 1911.

Drainage area, 2,175 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet.
April.....	638	155	366	0.169	0.19	21,779
May.....	1,118	211	419	0.192	0.22	25,763
June.....	1,541	130	382	0.176	0.20	22,731
July.....	1,069	80	228	0.105	0.12	14,019
August.....	188	70	111	0.051	0.06	6,825
September.....	1,210	66	417	0.192	0.21	24,813
October.....	327	115	176	0.081	0.09	10,822
November (1-8)	153	114	135	0.062	0.02	2,146
The period..						128,898

MILK RIVER AT SPENCER'S LOWER RANCHE, ALTA.

This station was established on August 7, 1909, by F. H. Peters. It is located on the S.E. 1⁴ Sec. 1, Tp. 1, Rge. 5, W. 4th Mer., about 1000 feet upstream from the International boundary. It is 90 miles by trail from Milk River station, 26 miles from Pendant d'Oreille police detachment and 19 miles from Wild Horse police detachment.

The river flows in one channel at all stages. It is straight for about 300 feet above and 500 feet below the station. The right bank is low, wooded and liable to overflow during extreme flood stages. The bed is composed of sand, which is constantly shifting.

Discharge measurements are made during high water by means of a cable, car, tagged wire, and stay wire, and at low stages by wading. The initial point for soundings is the inner face of a round post on the left bank.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the right bank, about 450 feet below the cable. The zero (elev., 85.32) is referred to a permanent iron bench-mark (assumed elev., 100.00) located on the left bank, 450 feet below the cable and directly opposite the gauge.

During 1911, the gauge was read by Charles Lattimer.

DISCHARGE MEASUREMENTS of Milk River at Spencer's Lower Ranche, Alta., in 1911.

Date.	Hydrographer	Width.	Area of	Mean	Gauge	Discharge.
		Feet.	Sq. ft.	Fl. per sec.	Feet.	Sec.-ft.
April 21	N. M. Sutherland	96.0	136.63	1.980	2.85	270.35
May 9	do	100.5	152.65	1.680	2.84	255.97
May 31	J. E. Degnan	94.5	178.77	2.146	3.22	383.57
June 20	do	95.0	86.63	1.527	2.42	132.30
July 14	do	88.0	100.99	1.395	2.40	140.92*
Aug. 14	do	105.0	102.26	1.510	2.54	154.46
Sept. 26	do	105.0	130.15	1.678	2.64	218.48
Oct. 29	do	102.5	86.55	1.320	2.20	115.76

* Measurement not taken at regular station.

DAILY GAUGE-HEIGHT AND DISCHARGE of Milk-River at Spencer's Lower Ranche, Alta., for 1911.

Day.	March.		April.		May.		June.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			3 13	357	3 18	367	3 20	379
2			3 18	373	3 04	323	3 05	334
3			3 40	444	2 84	263	2 98	309
4			3 18	373	2 76	235	2 91	289
5			2 20	114	2 68	214	2 90	287
6			2 44	161	2 51	170	2 88	279
7			2 16	108	2 65	204	2 86	274
8			2 89	280	2 69	214	2 87	275
9			2 70	227	2 84	256	2 84	269
10			2 79	252	2 94	286	2 75	240
11			2 70	227	3 00	306	2 65	212
12			2 65	214	2 78	241	2 58	193
13			2 10	99	2 87	269	2 76	239
14			2 36	144	2 77	242	2 74	232
15			3 08	341	2 84	262	2 62	198
16	2 80	255	3 00	315	3 00	310	2 56	190
17	2 78	249	2 85	269	2 94	291	2 53	171
18	2 76	244	2 76	244	4 68	1,013	2 51	162
19	2 74	238	2 84	266	4 28	804	2 45	144
20	2 86	272	2 78	249	3 90	630	2 43	135
21	3 05	331	2 84	266	3 90	630	2 39	129
22	2 98	309	3 00	317	3 34	420	2 97	275
23	3 63	528	2 76	243	3 23	387	2 64	183
24	4 60	981	2 88	275	3 10	347	2 59	171
25	3 86	619	3 30	407	3 05	330	3 64	490
26	3 84	611	3 30	407	3 17	369	3 72	519
27	3 68	547	3 25	391	3 14	361	5.86	1,655
28	3 60	516	3 14	355	3 13	358	4 62	948
29	3 54	494	3 32	411	3 19	375	4 13	701
30	3 24	392	3 33	414	3 25	395	3 78	549
31	3 10	347	....	...	3 24	392	....	...



Camp Equipment of the Hydrographer in the Western Cypress Hills district.

DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River at Spencer's Lower Ranche, Alta.,
for 1911.—Continued.

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.32	789	2 10	87	1 95	70	2 64	218	2 44	167
2....	4.45	853	2 05	78	1 94	71	2 55	194	2 10	101
3.....	3.69	520	2 20	99	1 95	72	3 02	331	2 10	101
4.....	3.55	469	2 25	107	3 84	582	2 96	312	2 68	229
5.....	3.53	461	2 38	129	4 08	689	3 08	350	2 36	149
6.....	3.34	399	2 45	142	5 45	1,409	2 85	278	2 60	207
7.....	3.20	355	2 34	120	4 87	1,088	2 84	275	2 65	221
8.....	2.96	291	2 56	164	4 82	1,068	2 84	275	2 83	*
9.....	2.75	229	2 54	159	4 32	809	2 85	278	2 63	...
10.....	2.74	218	2 63	180	4 00	660	2 86	281	2 64	...
11....	2.68	213	2 70	195	3 96	646	2 78	259	2 74	...
12....	2.53	188	2 65	182	3 74	559	2 70	235	2 66	...
13....	2.51	166	2 61	172	3 56	510	2 64	218	2 56	...
14....	2.44	149	2 60	169	3 35	419	2 58	202	2 52	...
15....	2.35	129	2 51	150	3 29	400	2 52	186	2 58	...
16....	2.33	126	2 46	140	3 05	325	2 47	174	2 58	...
17....	2.25	116	2 48	145	2 89	279	2 45	169	2 59	...
18....	2.25	115	2 38	128	2 80	253	2 44	166	2 60	...
19....	2.23	108	2 30	114	2 74	235	2 42	162	...	...
20.....	2.24	110	2 27	109	2 72	233	2 41	159	...	...
21....	2.14	95	2 10	86	2 64	211	2 39	155	...	...
22....	2.24	110	2 05	79	2 68	222	2 36	149	...	...
23.....	2.24	110	2 05	79	2 76	246	2 36	149	...	...
24....	2.26	112	2 04	79	2 75	245	2 37	151	...	...
25....	2.28	115	1 90	72	2 69	231	2 38	153	...	...
26....	2.25	111	2 03	76	2 64	216	2 35	146	...	...
27....	2.22	105	2 00	75	2 75	249	2 31	138	...	...
28....	2.18	98	2 00	75	2 64	218	2 29	134	...	...
29....	2.15	93	1 99	74	2 69	232	2 24	124	...	...
30....	2.13	90	1 98	75	2 64	218	2 30	136	...	...
31.....	2.10	87	1 96	71	....	...	2 28	132	...	...

NOTE—Discharges for gauge heights over 3.40 are estimated.
* Ice conditions, not sufficient data to compute the discharge after Nov. 7.

MONTHLY DISCHARGE of Milk River at Spencer's Lower Ranche, Alta., for 1911.

Drainage area, 2,448 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet.
March (16-31)	981	238	433	0.177	.10	13,751
April..	444	99	285	0.116	.13	16,959
May ..	1,013	170	363	0.148	.17	22,320
June ..	1,655	129	348	0.142	.16	20,707
July.....	853	87	230	0.094	.11	14,142
August ..	195	71	116	0.048	.06	7,133
September ..	1,409	70	422	0.172	.19	25,111
October ..	350	124	200	0.082	.09	12,298
November (1-7) ..	229	101	168	0.069	.02	2,332
The period...					1.03	134,753

DEER CREEK AT DICKINSON'S RANCHE, ALTA.

This station was established May 26, 1911, by J. E. Degnan. It is 22 miles by trail from Coutts and is located on the S.W. ¼ Sec. 15, Tp. 1, Rge. 12, W. 4th Mer., about 300 feet above the dam and intake of Dickinson Bros' irrigation ditch and about one quarter of a mile above their ranche buildings.

The stream flows in one channel and is straight for about 30 feet above and 100 feet below the station. The right bank is composed of a sandy loam, covered with rose bushes, and is liable to overflow. The left bank is high and liable to overflow. The bed of the stream is composed of gravel and sand, and is about 40 feet wide. In ordinary stages the stream averages from six feet to ten feet wide, and runs along the right side of the bed. It is liable to great change in high water, but apparently remains constant in low water.

Discharge measurements are made by wading. The initial point for sounding is the face of a stake driven in the left bank and marked 'I.P.'

The gauge, which is a plain staff graduated to feet and hundredths, is located at the right bank. The zero (elev., 90.72) is referred to the top of a post at the final point for soundings on the right bank (assumed elev., 100.00).

During 1911, the gauge was read by N. Dickinson.

DISCHARGE MEASUREMENTS of Deer Creek at Dickinson's Ranche, Alta., in 1911.

Date.	Hydrographer	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 26.....	J. E. Degnan.....	7.5	3.29	0.81	1.75	2.67
June 6.....	do	7.0	3.22	0.79	1.75	2.55
June 26.....	do	25.0	9.77	2.13	2.34	20.82
July 8.....	do	7.0	3.25	1.38	2.16	4.48*
July 24.....	do	7.0	2.54	0.54	2.05	1.36
Aug. 11.....	do	19.0	5.44	1.16	2.19	6.30
Aug. 21.....	do	6.0	2.68	0.94	2.10	2.51
Sept. 2.....	do	6.0	2.00	0.27	1.97	0.54
Sept. 20.....	do	8.3	5.80	1.19	1.46	6.89
Oct. 24.....	do	7.5	4.74	0.70	1.29	3.30
Nov. 6.....	do	8.0	4.30	0.60	1.22	2.56

* Gauged upstream from the regular section.

DAILY GAUGE-HEIGHT AND DISCHARGE of Deer Creek at Dickinson's Rancho, Alta., for 1911.

	May.		June.		July.	
	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	..		1.80	4 20	2 60	50 5
2.....	..		1.78	3 60	2 50	39 0
3.....	..		1.76	3 00	2 40	27 5
4.....	..		1.76	3 00	2 30	16 0
5.....	1.75	2 70	2 20	7 0
6.....	..		1.73	2 10	2 15	4 75
7.....	..		1.72	1 80	2 14	4 30
8.....	..		1.70	1 20	2 13	3 85
9.....	..		1.68	1 06	2 12	3 40
10.....	..		1.67	0 99	2 11	2 95
11.....	..		1.65	0 85	2 10	2 50
12.....	..		1 64	0 78	2 09	2 35
13.....	..		1.64	0 78	2 08	2 20
14.....	..		1.63	0 71	2 06	1 90
15.....	..		1.63	0 71	2 05	1 75
16.....	..		1.61	0 57	2 05	1 75
17.....	..		1.59	0 45	2 04	1 60
18.....	..		1.58	0 40	2 06	1 90
19.....	..		1.61	0 57	2 06	1 90
20.....	..		1 61	0 57	2 05	1 75
21.....	..		1.65	0 85	2 04	1 60
22.....	..		1.67	0 99	2 05	1 75
23.....	..		1 68	1 06	2 05	1 75
24.....	..		3.00	127 00	2 05	1 75
25.....	..		2.90	99 00	2 04	1 60
26.....	1.75	2.70	2.35	21 30	2 04	1 60
27.....	1 75	2.70	2.32	18 10	2 04	1 60
28.....	1.77	3.30	2.30	16 00	2 05	1 75
29.....	1.78	3.60	2.25	11 50	2 00	1 00
30.....	1.82	5.60	2.15	4 75	2 05	1 75
31.....	1.82	5.60	..		2 04	1 60

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Deer Creek at Dickinson's Rancho, Alta.,
for 1911.—Continued.

Day.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2.04	1.60	1.97	0.70	1.39	5.00		
2	2.25	11.50	1.97	0.70	1.43	5.70		
3	2.25	11.50			1.49	6.80		
4	2.25	11.50			1.53	8.84		
5	2.24	10.60	....		1.59	10.50		
6	2.25	11.50	....		1.67	12.60	1.22	2.60
7	2.26	12.40			1.67	12.60	1.22	2.60
8	2.27	13.30			1.63	11.40		
9	2.28	14.20			1.60	10.50		
10	2.24	10.60			1.56	9.68		
11	2.19	6.50						
12	2.18	6.10						
13	2.17	5.60						
14	2.16	5.20						
15	2.14	4.30						
16	2.11	2.95						
17	2.08	2.20						
18	2.06	1.90						
19	2.06	1.90						
20	2.08	2.20	1.46	6.30	1.44	5.92		
21	2.10	2.50						
22	2.02	1.30			1.29	3.30		
23	2.01	1.15			1.29	3.30		
24	2.01	1.15			1.29	3.30		
25	2.02	1.30						
26	2.01	1.15						
27	2.01	1.15						
28	1.99	0.90						
29	1.98	0.80						
30	1.98	0.80						
31	1.97	0.70						

NOTE—Heavy rains in early part of September caused a larger run-off during that month than usual, but on Sept. 4 the gauge was washed out and no observations were made during the high water period. The gauge was re-established on Sept. 19, but the observer was away from home from Sept. 20 to Oct. 1, and from Oct. 10 to Oct. 20, and no observations were made during his absence. Creek froze over Oct. 25. Opened Nov. 6 and 7 and froze up again on Nov. 8.

MONTHLY DISCHARGE of Deer Creek near Dickinson's Rancho, for 1911.

Drainage area, 6 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet.
May (20-31)	5.6	2.7	3.92	0.653	0.15	47
June	127.0	0.40	11.0	1.830	2.04	655
July	50.5	1.00	6.34	1.060	1.22	390
August	14.2	0.70	5.17	0.862	0.99	318
September (1, 2 and 20)	6.30	0.70	2.57	.428	0.05	15
October (1-10, 20, 22-24)	12.6	3.30	7.80	1.300	0.68	217
The period						1,642

DEER CREEK AT DEER CREEK CATTLE COMPANY'S RANCHE.

This station was established May 27, 1911, by J. E. Degnan. It is 24 miles by trail from Coutts, and is located on the N.E. ¹/₄ Sec. 26, Tp. 1, Rge. 12, W. 4th Mer. It is about one mile upstream from the Deer Creek Cattle Co's ranche buildings, three quarters of a mile above their dam and intake, and three miles below Dickinson Bros' dam and intake.

The stream flows in one channel and is straight for sixty feet above and fifty feet below the station. The right bank is composed of a sandy loam, and is liable to overflow during high water for about forty feet from the bank. The left bank is composed of a sandy loam, is high with a gradual slope and not liable to overflow. The bed of the stream consists of gravel and sand, and is liable to great change in high water, apparently remaining constant during low water.

Discharge measurements are made by wading. The initial point for sounding is the face of a cedar post in the left bank, marked 'B.M.'

The gauge is a plain staff graduated to feet and hundredths, located at the right bank, The zero (elev., 89.47) is referred to the top of the post at the initial point for soundings on the left bank (assumed elev., 100.00).

During 1911, the gauge was read by H. Webster.

DISCHARGE MEASUREMENTS of Deer Creek at Deer Creek Cattle Company's Ranche, in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 27.....	J. E. Degnan.....	6.5	2 33	0.906	1.710	2.11
June 25.....	do	14.0	12 68	3.540	2.560	44.87*
July 8.....	do	8.5	4 04	1.130	2.140	4.54
July 24.....	do	7.0	1.69	0.437	1.940	0.74
Aug. 21.....	do	6.0	2.56	0.679	2.030	1.74
Sept. 20.....	do	8.5	4.30	1.374	2.560	5.91
Oct. 25.....	do	8.0	3 68	0.959	2.495	3.53
Nov. 6.....	do	8.0	2 88	0.559	2.420	1.61

* Measurement not taken at regular station.

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Deer Creek at Deer Creek Cattle Co's Ranche, Alta., for 1911.

DAY.	May.		June.		July.		August.		September.		October.	
	Gauge Height	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.83	5 50	.....	.....	1 93	.....	*	.....	2.57	6.40
2.....	1.81	4 80	.....	.....	1 93	.....	*	.....	2.59	7.10
3.....	1 74	3 00	.....	.....	1 98	.....	*	.....	2 59	7 10
4.....	1 74	3 00	.....	.....	2.00	.....	*	.....	*	.....
5.....	1.73	2 80	.....	.....	2.03	.....	*	.....	*	.....
6.....	1 71	2 30	.....	.....	2.03	.....	.....	.....	*	.....
7.....	1 65	1 30	‡	.....	2.00	.....	*	.....	*	.....
8.....	1.65	1 30	2.14	4 20	2 00	.....	*	.....	*	.....
9.....	1 60	0 50	1 99	1 60	2 00	.....	*	.....	*	.....
10.....	1 60	0 50	1.99	1 60	2 00	.....	*	.....	*	.....
11.....	1 60	0 50	1 98	1 40	2 01	.....	*	.....	*	.....
12.....	1 60	0 50	1.98	1 40	2 02	.....	*	.....	*	.....
13.....	1 58	0 40	1.98	1 40	2 03	.....	*	.....	*	.....
14.....	1 52	0 20	1.99	1 60	2 00	.....	*	.....	*	.....
15.....	1 48	0 10	2.00	1 70	2 00	.....	*	.....	*	.....
16.....	1 48	0 10	1.99	1 60	2 00	.....	*	.....	*	.....
17.....	1 48	0 10	1 98	1 40	2 00	.....	*	.....	*	.....
18.....	1 48	0 10	1.97	1 30	2 00	.....	*	.....	*	.....
19.....	1 48	0 10	1 96	1 10	2 00	.....	*	.....	*	.....
20.....	1 48	0 10	1.95	1 00	1 99	.....	2.56	6 00	*	.....
21.....	1 54	0 30	1.93	0 70	1 98	.....	2.55	5 60	*	.....
22.....	1 71	2 30	1.93	0 70	1 98	.....	2.58	6 80	*	.....
23.....	1 71	2 30	2.01	1 90	1 97	.....	2.59	7 10	*	.....
24.....	*	1.94	0 90	1 97	.....	2.59	7 10	*	.....
25.....	2 56	44 90	1.95	1 00	1 98	.....	2.58	6 80	2.50	3.80
26.....	‡	1.96	1 10	2 00	.....	2.58	6 80	2.47	3.00
27.....	1 74	3.00	.....	.....	1.97	1 30	2 00	.....	2.56	6 00	2.50	3.80
28.....	1 77	3 80	.....	.....	1.95	1 00	2 00	.....	2.55	5 60	2.52	4.50
29.....	1.77	3.80	.....	.....	1 94	0 90	2 00	.....	2.56	6 00	.....	.....
30.....	1 85	6.10	.....	.....	1 94	0 90	2 00	.....	2.56	6 00	.....	.....
31.....	1.87	6.80	.....	.....	1.93	0.70	2 00	.....	.....	.....	.....	.....

Gauge heights for August are not reliable on account of changing conditions.
Discharge for gauge heights above 2.56 estimated.
*No observations. ‡Gauge washed out. †Gauge replaced.

MONTHLY DISCHARGE of Deer Creek at Deer Creek Cattle Company's Ranche, for 1911.

Drainage area, 13 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet.
May (27-31)	6.8	3.0	4.70	0.362	0.07	47
June (1-23 and 25).....	44.9	0.10	3.21	0.247	0.22	153
July (8-31)	4.2	0.70	1.35	0.104	0.09	64
September (20-30)	7.1	5.6	6.3	0.488	0.20	138
October (1-3, 25-28)	7.1	3.0	5.1	0.395	0.10	71
The period.....	.....	.....	.....	.....	.....	473

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Milk River Drainage Basin, in 1911.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity	Dis-charge
				Feet.	Sq. ft.	Feet per Sec.	Sec.-ft.
April 26	N. M. Sutherland.	Beargulch Creek...	Sec. 19-2-9-4.....	2.60	0.64	0.830	0.53
May 5	"	"	"				0.37
May 13	"	"	"				Nil.
June 5	J. E. Degnan...	"	"	4.50	2.09	0.483	1.01
July 22	"	"	Sec. 20-2-9-4.				Nil.
Aug. 12	"	"	" 19-2-9-4.....				Nil.
Oct. 26	"	"	"	8.00	2.61	0.911	2.38
May 3	L. J. Gleeson.....	Creek	" 24-1-23-4	4.00	0.75	0.660	*0.50
May 4	"	"	" 19-2-18-4.	3.00	3.00	0.400	*1.20
April 18	"	Dead Horse Creek...	" 4-2-11-4..	0.90	0.22	0.760	0.17
April 26	"	"	"				Nil.
May 28	"	"	" 10-2-11-4.....				0.02
July 22	"	"	" 4-2-11-4..				Nil.
Aug. 18	"	"	"	1.85	0.48	0.416	0.20
Sept. 23	"	"	"	3.00	2.82	1.880	5.31
Oct. 26	"	"	"	4.50	2.03	0.931	1.89
Nov. 24	"	"	"	6.50	2.88	1.360	3.92
April 18	N. M. Sutherland...	Halfbreed Creek.....	" 28-2-10-4	3.80	1.36	1.630	2.22
April 26	"	"	"	3.50	0.97	1.400	1.39
May 5	"	"	"	3.70	1.03	1.330	1.37
May 13	"	"	"	3.00			1.01
May 28	J. E. Degnan.....	"	"	10.5	6.48	0.856	5.55
June 5	"	"	" 22-2-10-4.	9.0	7.6	0.706	5.37
July 22	"	"	" 28-2-10-4.	5.0	1.05	0.78	0.82
Aug. 18	"	"	"	9.5	4.75	0.357	1.70
Sept. 23	"	"	" 21-2-10-4	10.0	10.44	1.38	14.4
Oct. 26	"	"	" 28-2-10-4	9.0	6.76	0.736	4.98
Nov. 4	"	"	"	9.8	6.49	1.36	8.71
May 31	"	Kennedy Creek.....	" 3-1-5-4.	x			0.07
June 20	"	"	"	5.5	2.02	0.787	1.59
July 14	"	"	"				Nil.
Sept. 26	"	"	"	6.5	3.66	0.685	2.56
July 15	"	Lost River.....	" 2-1-4-4.				Nil.
July 22	"	Miners Coulee.....	" 10-2-11-4				Nil.
Aug. 18	"	"	"	5.5	2.82	0.673	1.90
Sept. 23	"	"	"	11.0	5.75	1.69	9.74
Oct. 3	"	"	"	18.0	16.92	2.151	36.40
Oct. 26	"	"	"	10.0	4.91	0.496	2.44
Nov. 4	"	"	"	10.0	4.80	1.24	5.98
July 18	"	Pritchard Coulee.....	" 4-1-11-4.				Nil.
April 17	N. M. Sutherland...	Police Creek.....	" 35-1-13-4.....	1.7	0.68	1.39	0.94
May 24	J. E. Degnan.....	"	"	x			0.24
May 25	"	"	"	x			0.480
July 7	"	"	"	5.0	1.65	1.096	1.810
Aug. 21	"	"	"	x			0.331
Sept. 2	"	"	"				Nil.
Sept. 11	"	"	"	9.0	7.54	1.274	9.610
Sept. 18	"	"	"	8.0	4.57	1.074	4.910
Oct. 4	"	"	"	9.5	8.16	1.102	9.000
Oct. 23	"	"	"	5.5	2.77	0.783	2.070
July 29	"	Red Creek.....	" 13-1-15-4				Nil.
Aug. 8	"	"	" 20-1-15-4				Nil.
Nov. 5	"	Spring Creek.....	" 31-2-11-4.....	2.7	2.01	0.587	1.180
July 25	"	Verdigris Creek.....	" 11-2-14-4				Nil.
Aug. 10	"	"	" 28-2-14-4				Nil.

x Weir measurement.

PAKOWKI LAKE DRAINAGE BASIN.

General Description.

The drainage into Pakowki Lake comes from three different directions; from the west by way of Etzikom Coulee, from the southeast in Canal and Ketchum creeks and from the northeast in Manyberries Creek. The lake has no outlet. The streams making up the drainage basin are very similar in their general characteristics, all having narrow, deep, and well defined valleys, with sparse growths of brush along the bottoms, and all draining a sandy and very unproductive-appearing soil. The drainage consists almost entirely of the spring run-off, the soil being so devoid of moisture as to take care of any ordinary rainfall without allowing any drainage into the streams.

Very little information has as yet been collected regarding the flow in any of the above mentioned streams, the one only touched upon as yet being Manyberries Creek. During the months of April, May, June and part of July, in 1911, Manyberries Creek showed an average run-off of 716 acre-feet per month. There was also a large run-off in September, but no records were obtained. Hooper and Huckvale have constructed very efficient irrigation works and divert water from Manyberries Creek to irrigate 2,120 acres of hay meadow. The yield of hay has been very much increased by the use of the water.

MANYBERRIES CREEK AT HOOPER AND HUCKVALE'S RANCHE.

This station was established June 17, 1910, by H. R. Carscallen. It is located on the S.E. ¼ Sec. 3, Tp. 5, Rge. 6, W. 4th Mer., at Hooper and Huckvale's ranche, seven miles east of Pakowki Lake, one and one quarter miles above Hooper and Huckvale's dam and intake, and below the mouth of the south branch.

The stream flows in one channel, and is straight for 400 feet above and 500 feet below the station. Both banks are high and do not overflow. They are composed of a sandy loam, sparsely covered with brush. The bed of the stream is composed of sand and gravel, which apparently remains constant.

Discharge measurements are made by wading. The initial point for soundings is the face of a stake driven close to the ground on the left bank and marked 'I.P.' At extreme low-water stage a weir is used.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the right bank. The zero elev., 79.48 is referred to the top of the post at the initial point for soundings (assumed elev., 100.00).

During 1911, the gauge was read by Sydney Hooper.

DISCHARGE MEASUREMENTS of Manyberries Creek at Hooper and Huckvale's Ranche, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 24.....	N. M. Sutherland.	9.0	3.92	2.140	1.38	8.38*
April 26.....	M. H. French.....	22.4	21.38	0.266	1.31	5.69
April 27.....	do	22.4	19.52	0.206	1.26	4.03
May 11.....	N. M. Sutherland.....	4.0	1.22	0.870	1.09	1.06*
June 2.....	J. E. Degnan.....	15" weir.	.	.	0.85	0.14*
July 17.....	do	.	.	.	0.69	Nil.
Aug. 16.....	do	15" weir.	.	.	0.70	0.039*
Sept. 28.....	do	4.0	1.63	0.450	0.82	0.730

* Measurement taken below regular station.

DAILY GAUGE-HEIGHT AND DISCHARGE of Manyberries Creek near Hooper and Huckvale's Ranche, Alta., for 1911.

Day.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1 01	0 65	1 52	16 10	1.02	0.70	3 57	220 2†
2.....	1 01	0 65	1 54	17 20	0 93	0.39	3 57	220 2†
3.....	1 10	1 10	1 76	30 00	0.83	0.16	2 44	80.4†
4.....	1 10	1 10	1 44	11 70	0 81	0.12	1 58	19 4
5.....	1 06	0 90	1 54	17 20	*	Nil.	1 16	2.1
6.....	1 05	0 85	1 38	8 70	.....	.....	1 09	1.0
7.....	1 01	0 65	1 30	5 30	.....	.....	0 99	0 57
8.....	1 03	0 75	1 24	3 70	.....	.....	0 92	0.36
9.....	1 26	4 30	1 18	2 40	.....	.....	0 88	0.26
10.....	2 69	103 00†	1 15	1 90	.....	.....	0 86	0.22
11.....	2 39	76 20†	1 10	1 10	.....	.....	0 84	0.18
12.....	1 56	18 30	1 08	1 00	.....	.....	0 80	0 10
13.....	1 42	10 60	1 06	0 90	.....	.....	0 77	0 07
14.....	1 34	7 00	1 07	0 95	.....	.....	0 75	0 05
15.....	1 25	4 00	1 08	1 00	.....	.....	0 74	0 04
16.....	1 33	6 60	1 12	1 40	.....	.....	†	.....
17.....	1 71	27 20	1 26	4 30	.....	.....	.....	.....
18.....	1 44	11 70	1 20	2 70	.....	.....	.....	.....
19.....	1 35	7 40	1 18	2 40	.....	.....	.....	.....
20.....	1 54	17 20	1 15	1 90	.....	.....	.....	.....
21.....	1 48	13 90	1 16	2 10	.....	.....	.....	.....
22.....	1 44	11 70	1 15	1 90	1 07	0.95	.....	.....
23.....	1 39	9 10	1 18	2 40	1.62	21.70	.....	.....
24.....	1 38	8 70	1 20	2 70	1.38	8.70	.....	.....
25.....	1 32	6 10	1 21	3 00	1 90	39.50†	.....	.....
26.....	1 28	4 80	1 42	10 60	2.55	90.00†	.....	.....
27.....	1 26	4 30	1 18	2 40	1.57	18.80	.....	.....
28.....	1 26	4 30	1 14	1 70	1 16	2.10	.....	.....
29.....	1 26	4 30	1 10	1 10	1.09	1 00	.....	.....
30.....	1 30	5 30	1 13	1 60	1 11	1 30	.....	.....
31.....	.....	.....	1 03	0 75	.....	.....	.....	.....

* No Gauge Heights given from June 5 to June 21.
Noted dry on June 5.
Rain-storm noted June 22.
† Approximate.
‡ Observer absent and no one else available after July 15th. Creek was almost dry after that date except for a week in September when, as the result of heavy rains, there was a good flow.

MONTHLY DISCHARGE of Manyberries Creek near Hooper and Huckvale's Ranche, Alta., for 1911.

Drainage area, 134 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet.
April.....	103	0.65	12.4	0.092	0.10	738
May.....	30	0.75	5.2	0.039	0.04	320
June.....	90	Nil.	6.2	0.046	0.05	369
July (1-15).....	220	0.04	36.3	0.270	0.15	1,080
The period.....	.....	.....	.....	.....	.....	2,507

MISCELLANEOUS DISCHARGE MEASUREMENTS in Pakowki Lake Drainage Basin, in 1911.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Dis-charge.
				Feet.	Sq. ft.	Feet per Sec.	Sec.-ft.
April 24	N. M. Sutherland...	Canal Creek	Sec. 6-4-6-4.....				0.436
May 11	"	"	" "				Nil.
July 21	J. E. Degnan.....	"	" "				Nil.
Aug. 16	"	"	" "				Nil.
July 17	"	S.B. Manyberries Crk.	" 11-5-6-4				Nil.
Aug. 16	"	"	" "				Nil.
July 21	"	Ketchum Creek.....	" 15-4-6-4				Nil.
Aug. 16	"	"	" "				Nil.

SAGE CREEK DRAINAGE BASIN.

General Description.

Sage creek is a small and unimportant stream which rises in the hills, or 'bad-lands,' a few miles north of the International boundary on the divide between Milk River and Lodge creek. The stream has no definite or permanent source of supply, and derives its discharge solely from the melting of snow, which accumulates in innumerable coulees during the winter months. When the first warm days of spring arrive the snow is melted and each coulee, acting as a water-course, throws its volume of water into the main stream. For a very short period the stream has a good flow, but soon dwindles and dries up. After leaving Canadian territory, Sage creek spreads out over a large dry lake which has no outlet. This dry lake is about ten miles long, and averages about one and a half miles wide, and lies southeast and northwest and close to the boundary. It is bounded on the south by a low range of hills and at some time has held probably two or three feet of water at its deepest parts, but since 1908, neither it nor Grassy Lake nor Wild Horse Lake have held any water.

SAGE CREEK AT WILD HORSE POLICE DETACHMENT.

This station was established on August 10, 1909, by F. H. Peters. It is located in Sec. 9, Tp. 1, Rge. 2, W. 4th Mer., about one and a quarter miles from Wild Horse police post. It is about 115 miles by trail from Milk River post office. The channel is straight for forty feet above and below the station. The banks are composed of hard clay and are high but liable to overflow. The bed is composed of hard gumbo clay. Discharge measurements are made by wading. The initial point for soundings is the face of a post on the right bank marked "0+00" in red paint. The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post in the centre of the channel. It is referred to the top of the post at the initial point for soundings. During 1911, the gauge was read by Corp. Tom Brewer, but, as the district hydrographer did not visit the station during 1911, estimates of the discharge have not been made. There are two small irrigation ditches under construction which will divert water from Sage Creek. It is not likely that any water was diverted during 1911.

MEAN DAILY GAUGE-HIGHT, in feet, of Sage Creek at Wild Horse Police Detachment, Alta., for 1911.

Day.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.
1	2 07	1 90	Dry	1 29	1 10	Dry.	2 50	1 00
2	2 03	1 60	"	1 27	1 02	"	3 64	1 00
3	2 02	1 20	"	3 86	1 00	"	3 57	1 00
4	1 98	1 20	"	3 76	1 00	1 02	3 21	
5	1 98	1 00	"	3 50	0 95	1 55	3 02	....
6	1 79	Dry	"	3 00	0 90	1 52	2 85	....
7	1 70	"	"	2 87	Dry.	6 01	2 78	....
8	1 65	"	"	2 50	"	5 52	2 78	....
9		"	"	2 42	"	4 42	2 77	....
10	1 62	"	"	2 21	"	4 38	2 74	....
11	1 70		"	2 00	"	4 34	2 72	....
12	1 73	"	"	1 96	"	4 10	2 66	....
13	1 72	"	"	1 90	"	3 85	2 61	....
14	1 72	"	"	1 88	"	3 10	2 50	....
15	2 25	"	"	1 80	"	2 35	2 42	....
16	2 07	"	"	1 76	"	2 10	2 35	....
17	2 04	"	"	1 68	"	1 81	2 29	....
18	1 90	"	"	1 60	"	1 81	2 20	....
19	1 60	"	"	1 55	"	1 80	1 98	....
20	1 70	"	"	1 53	"	1 80	1 98	....
21	1 65	"	"	1 51	"	1 77	1 86	....
22	1 41	"	"	1 52	"	1 84	1 72	....
23	1 40	"	"	1 51	"	1 83	1 61	....
24	1 32	"	"	1 48	"	1 87	1 34	....
25	1 25	"	"	1 47	"	1 87	1 19	....
26	1 20	"	"	1 44	"	1 82	1 01	....
27	1 17	"	"	1 40	"	1 77	1 01	....
28	1 10	"	"	1 35	"	1 71	1 00	....
29	1 12	"	"	1 33	"	1 74	1 00	....
30	1 11	"	"	1 30	"	1 73	1 00	....
31		"	"	1 24	"		1 00	....

LODGE CREEK DRAINAGE BASIN.

General Description.

Lodge Creek, which rises in township 7, range 3, west of the fourth meridian, flows in a southerly direction for about 12 miles, then turns south-eastward, crosses the International Boundary in section 4, township 1, range 28, west of the third meridian, and eventually empties into Milk river near Chinook, Montana. Its principal tributary is Middle Creek which joins it in section 4, township 2, range 29, west of the third meridian.

Near its head the valley is very deep and narrow but it broadens out considerably lower down, giving rise to large flats and meadows. The upper part of the drainage basin is cut up to a great extent by deep coulees which drain into the creek. This part of the creek is thickly covered with brush along the banks, but lower down it is totally devoid of tree growth. The valley is rather unproductive owing to the absence of moisture but a few good hay meadows have developed along its course through the storage of the flood waters and their application to the soil by irrigation. As is the case with many of the streams in this locality the flow in Lodge Creek is not continuous throughout the year, the creek being dry, with the exception of pools of standing water, during the greater part of the summer months. At flood stages the creek carries a considerable amount of water and as a result its channel is wide and well defined throughout the whole length of its course.

Two stations have been established on the main stream, one at Willow Creek police detachment near the International Boundary, and the other near the head of the creek at Hart's ranche. Descriptions of these stations are given below.

EAST BRANCH OF LODGE CREEK AT ENGLISH'S RANCHE.

This station was established on October 7, 1911, by M. H. French. It is located at James English's ranche in the S.E. 1/4 Sec. 1, Tp. 7, Rge. 3, W. 4th Mer., about 150 feet north of his house. It is about 45 miles by trail from Medicine Hat.

The channel is straight for about 50 feet above and 25 feet below the station. Both banks are wooded and high enough to contain the stream during all stages. The bed is composed of very coarse gravel and will not shift.

SESSIONAL PAPER No. 25d

Discharge measurements are made with a meter by wading a short distance above the gauge. The initial point for soundings is a four-inch stake, one foot above ground on the left bank.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post sunk in the bed of the stream near the left bank. The zero of the gauge (elev., 94.92) is referred to the top of the initial point stake (assumed elev., 100.00). As a further reference the top of the final point stake is 0.83 feet below the top of the initial point stake. The gauge was read by Mrs. Annie English.

DISCHARGE MEASUREMENTS of East Branch of Lodge Creek at English's Ranche, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Oct. 7.....	M H. French	8.6	2.68	0.388	0.96	1.04

MEAN DAILY GAUGE-HEIGHT, in feet, of East Branch Lodge Creek, at English's Ranche, Alta., for 1911.

Day.	October.	November.
1.....		1.17
2.....		1.17
3.....		1.18
4.....		1.20
5.....		
6.....		
7.....	0 95	
8...	0 95	
9.....	0 94	
10.....	0 92	
11.....	0 90	
12.....	0 90	
13.....	0 90	
14.....	0 90	
15.....	0 90	
16.....	0 88	
17.....	0 92	
18.....	0 98	
19.....	0 99	
20.....	0 99	
21.....	1 00	
22.....	1 04	
23.....	1 05	
24.....	1 07	
25.....	1 07	
26.....	1 08	
27.....	1 09	
28.....	1.10	
29.....	1 12	
30.....	1 15	
31.....	1.16	

ANDERSON DITCH NEAR THELMA.

This station was established on September 23, 1911, by W. A. Fletcher. It is located on the S.W. 14 Sec. 23, Tp. 6, Rge. 3, W. 4th Mer., about fifteen feet below the intake of the ditch, and about one quarter of a mile from Robert Henderson's house.

The gauge, which is a plain staff graduated to feet and inches, is fixed to a post at the left bank of the ditch. The zero of the gauge (elev., 98.63) is referred to the top of a stake (assumed elev., 100.00), about five feet southeast of the gauge.

The channel is straight for twenty feet above and thirty feet below the gauge. Both banks are low, but are not liable to overflow. The bed is composed of clay and gravel and is not liable to shift.

Discharge measurements are made by wading near the gauge. The initial point for soundings is the inner face of the post used as a bench-mark.

No water was diverted after the gauge had been installed.

LODGE CREEK AT HART'S RANCHE.

This station was established July 22, 1909, by F. T. Fletcher. It is located just north of the road allowance between Secs. 15 and 10, Tp. 6, Rge. 3, W. 4th Mer., about one half mile below the junction of the east and west branches of Lodge Creek and is about 45 miles by trail south of Medicine Hat.

The channel is straight for about 60 feet above and 250 feet below the station. The banks are high, steep and not liable to overflow. Both are covered with a dense growth of willow brush. The bed of the stream is composed of soft clay and there is one channel at all stages. On account of the narrow channel, the steep banks and soft condition of the creek bed, the stream cannot be waded at any stage. Discharge measurements are made at a bridge a few hundred feet downstream.

The gauge is a plain staff graduated to feet and hundredths, spiked to a post sunk in the bed of the stream near the left bank. The zero of the gauge (elev., 86.36, is referred to a permanent iron bench-mark (assumed elev., 100.00), which is located upon the left bank 4.91 feet south of the square stake used as the initial point for soundings and in line with the square stake upon the right bank used as the final point.

During 1911, the gauge was read by Mrs. Clara B. Hart.

The intake of Mr. Hart's irrigation ditch is about a mile above this station, but very little water passed through it during 1911.

DISCHARGE MEASUREMENTS of Lodge Creek at Hart's Ranche, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Fl. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 25	M. H. French.....	13.7	31.19	0.722	3.06	22.51
May 22	do	9.3	10.40	0.337	1.35	3.51
Oct. 5.....	do	9.0	10.95	0.294	2.02*	3.22

* Beaver dams raising water.

DAILY GAUGE-HEIGHT AND DISCHARGE of Lodge Creek at Hart's Ranche, Alta., for 1911.

Day.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	.....	.....	2.47	14.0	1.08	2.2	4.80	55.0
2.....	.....	.....	2.55	16.0	1.08	2.2	4.75	54.0
3.....	.....	.....	2.92	20.0	1.10	2.3	2.95	21.0
4.....	.....	.....	3.10	23.0	1.00	1.7	2.15	10.0
5.....	.....	.....	2.82	19.0	0.75	0.7	2.00	9.0
6.....	.....	.....	1.92	8.2	0.66	0.3	1.85	7.0
7.....	.....	.....	1.88	7.8	Dry.	Nil.	1.40	4.1
8.....	.....	.....	1.68	6.0	"	"	1.30	3.5
9.....	.....	.....	1.60	5.4	"	"	1.40	4.1
10.....	.....	.....	1.60	5.4	"	"	1.45	4.4
11.....	.....	.....	1.81	7.1	"	"	1.35	3.8
12.....	.....	.....	1.80	7.0	"	"	1.15	2.6
13.....	.....	.....	1.65	5.8	"	"	1.10	2.3
14.....	.....	.....	1.65	5.8	"	"	1.05	2.0
15.....	.....	.....	1.76	6.7	"	"	0.98	1.6
16.....	.....	.....	2.47	14.0	"	"	0.95	1.5
17.....	.....	.....	2.58	16.0	"	"	0.70	0.5
18.....	.....	.....	1.94	8.4	"	"	0.55	0.1
19.....	.....	.....	1.72	6.4	"	"	Dry.	Nil.
20.....	.....	.....	1.90	8.0	"	"	"	"
21.....	.....	.....	1.65	5.8	0.95	1.5	"	"
22.....	.....	.....	1.35	3.8	7.50	144.0	"	"
23.....	.....	.....	1.85	7.5	2.65	17.0	"	"
24.....	.....	.....	2.70	18.0	2.75	18.0	"	"
25.....	4.08	41.0	1.65	5.8	6.25	98.0	"	"
26.....	3.00	22.0	1.94	8.4	4.44	48.0	"	"
27.....	2.45	14.0	1.71	6.5	3.00	22.0	"	"
28.....	1.95	8.5	1.66	5.9	2.10	10.0	"	"
29.....	1.93	8.3	1.35	3.8	2.00	9.0	"	"
30.....	2.24	11.0	1.15	2.6	1.80	7.0	"	"
31.....	.....	.....	1.15	2.6	.....	.....	"	"

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Lodge Creek at Hart's Ranche, Alta., for 1911—Con.

Day.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1...	Dry.	Nil.	Dry.	Nil.	1.62	2.0	1.05	2.0
2	"	"	"	"	1.55	1.2	1.05	2.0
3	"	"	"	"	1.65	1.3	1.05	2.0
4	"	"	4.00	39.0	2.15	4.0		
5	"	"	6.00	91.0	2.01	3.4		
6	"	"	4.60	51.0	1.00	1.7		
7	"	"	2.10	10.0	0.97	1.6		
8...	"	"	1.95	8.5	0.95	1.3		
9	"	"	1.46	4.5	0.85	1.1		
10....	"	"	1.10	2.3	0.90	1.3		
11	"	"	1.00	1.7	0.95	1.5		
12	"	"	0.95	1.0	0.96	1.5		
13	"	"	0.95	1.0	0.95	1.5		
14	"	"	0.78	0.5	0.97	1.5		
15....	"	"	0.70	0.2	0.96	1.5		
16	"	"	0.65	0.1	0.97	1.6		
17	"	"	0.80	0.4	0.97	1.6		
18	"	"	0.92	0.6	1.01	1.8		
19	"	"	1.00	0.7	1.00	1.7		
20	"	"	1.30	1.8	1.15	2.6		
21	"	"	1.28	1.6	1.15	2.6		
22	"	"	1.25	1.2	1.25	3.2		
23...	"	"	1.20	1.0	1.50	4.7		
24	"	"	1.30	1.2	1.25	3.2		
25	"	"	1.50	1.8	1.15	2.6		
26	"	"	1.60	2.0	1.10	2.3		
27	"	"	1.67	2.2	1.10	2.3		
28	"	"	1.70	2.4	1.08	2.2		
29	"	"	1.68	2.0	1.08	2.2		
30	"	"	1.65	1.8	1.07	2.1		
31	"	"			1.05	2.0		

NOTE—Changing conditions from Sept. 12 to Oct. 5, because of beaver dams. On Oct. 5, part of the dam was removed which lowered the gauge heights 0.8 feet.

MONTHLY DISCHARGE of Lodge Creek at Hart's Ranche, Alta., for 1911.

Drainage area, 78 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet.
April (25-30)...	41.0	8.3	17.47	0.224	0.050	208
May	23.0	2.6	9.06	0.116	0.134	557
June.....	144.0	0.0	12.89	0.164	0.183	762
July	55.0	0.0	6.05	0.078	0.090	372
August.....	00.0	0.0	0.00	0.000	0.000	00
September.....	91.0	0.1	7.71	0.099	0.110	459
October.....	4.7	1.1	2.10	0.027	0.031	129
November (1-3)...	2.0	2.0	2.00	0.026	0.003	12
The period.....					0.601	2,499

NOTE—There was considerable run-off before April 25 not included in this data. The water diverted from Lodge Creek above this station by Hart's irrigation ditch, and several small ditches in Medicine Lodge Coulee is inappreciable for 1911.

MIDDLE CREEK AT MCKINNON'S RANCHE.

This station was established June 21, 1910, by H. R. Carscallen. It is located on the S.W. 1/4 Sec. 35, Tp. 5, Rge. 1, W. 4th Mer., about eleven miles southwest of Battle Creek post office.

The channel is almost straight for about 150 feet above and 100 feet below the station. The right bank is high with a gradual slope; the left bank is high and steep. Neither bank is liable to overflow except in extreme flood. The bed of the stream is composed of sand and coarse gravel. During ordinary stages, discharge measurements are made with a current-meter by wading, and at extreme low stages a weir is used.

The gauge is a plain staff graduated to feet and hundredths, spiked to a post sunk in the bed of the stream near the left bank. The zero of the gauge (elev., 91.49) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated on the left bank about 25 feet from the edge of the bank. It is also 664 feet northeast of the N.E. corner of Sec. 27, Tp. 5, Rge. 1, W. 4th. Mer.

During 1911, the gauge was read by Angus McKinnon.

Springs just above this station keep the creek flowing at this point all summer, although at other places it is often dry. A small amount of water is stored in Mr. McKinnon's dam about two miles above this station.

DISCHARGE MEASUREMENTS of Middle Creek at McKinnon's Ranche, in 1911.

Date.	Hydrographer	Width.	Area of Section.	Mean Velocity	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 24.....	M. H. French.....	15.0	22.60	0.754	2.10	17.05
May 20.....	do.....	10.0	4.24	0.239	0.62	1.01
June 12.....	do.....	9.6	3.41	1.630	0.55	0.56*
July 20.....	do.....		4.64	0.114	0.71	0.53*
Aug. 11.....	do.....	11.0	4.85	0.137	0.68	0.67*
Oct. 4.....	do.....	11.5	4.37	0.215	0.63	0.94

* Weir measurements.

DAILY GAUGE-HEIGHT AND DISCHARGE of Middle Creek at McKinnon's Ranche, Alta., for 1911.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0.62		3.15		3.42		1.70	10.5	0.84	2.0	0.58	0.7
2	0.62		3.14		3.45		1.70	10.5	0.70	1.2	0.58	0.7
3	0.62		3.20		3.47		1.68	10.2	0.95	2.8	0.58	0.7
4	0.62		3.22		3.48		1.67	10.1	1.08	3.8	0.57	0.7
5	0.62		3.22		3.48		1.66	10.0	0.79	1.7	0.57	0.7
6	0.62		3.25		3.50		1.64	9.7	0.75	1.5	0.56	0.6
7	0.62		3.27		3.51		1.64	9.7	0.64	1.0	0.58	0.7
8	0.62		3.27		3.52		1.66	10.0	0.64	1.0	0.60	0.8
9	0.62		3.29		3.57		1.69	10.4	0.61	0.8	0.57	0.7
10	0.62		3.30		3.61		3.10	41.0	0.59	0.8	0.56	0.6
11	0.62		3.30		3.65		4.85	156.0	0.59	0.8	0.56	0.6
12	0.62		3.32		3.68		3.00	38.0	0.60	0.8	0.55	0.6
13	0.62		3.33		3.77		2.40	23.0	0.58	0.7	0.55	0.6
14	0.62		3.35		3.79		1.35	6.4	0.62	0.9	0.57	0.7
15	0.62		3.35		3.81		0.99	3.1	0.64	1.0	0.56	0.6
16	0.62		3.35		3.85		0.88	2.2	0.75	1.5	0.56	0.6
17	0.62		3.38		3.90		1.80	12.0	0.67	1.1	0.56	0.6
18	0.62		3.38		3.97		2.78	31.0	0.65	1.0	0.57	0.7
19	0.62		3.38		4.00		2.38	22.6	0.60	0.8	0.59	0.8
20	0.62		3.38				2.47	26.4	0.62	0.9	0.59	0.5
21	0.62		3.38				2.37	22.4	0.60	0.8	0.63	0.7
22	0.62		3.38				2.22	19.4	0.59	0.8	0.70	1.0
23	0.64		3.38				2.07	16.5	0.64	1.0	*2.20	18.0
24	0.68		3.40		1.70		2.16	18.2	0.63	0.9	*3.05	39.0
25	0.91		3.41		1.72		1.55	8.6	0.63	0.9	*2.58	24.0
26	1.10		3.41		1.68		1.33	6.1	0.62	0.9	1.17	4.4
27	1.71		3.41		1.70		0.94	2.7	0.61	0.8	2.50	24.0
28	2.10		3.41		1.72		1.02	3.4	0.60	0.8	1.92	13.5
29	2.60				1.72		1.17	4.6	0.61	0.8	1.16	4.0
30	3.70				1.72		1.15	4.4	0.60	0.8	1.08	3.3
31	3.10				1.72				0.60	0.8		

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Middle Creek at McKinnon's Ranche, Alta.,
 for 1911.—Continued.

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1 16	4 0	0 67	0 5	0 55	0 4	0 64	1 0	0 62	0 9
2.....	3 57*	60 0	0 70	0 8	0 54	0 4	0 64	1 0	0 62	0 9
3.....	2 95*	36 0	0 95	2 0	0 54	0 4	0 64	1 0	0 62	0 9
4.....	2 28	21 0	0 68	0 6	0 75	1 5	0 63	0 9	0 62	0 9
5.....	1 73	10 5	0 68	0 6	1 18	4 6	0 63	0 9	0 62	0 9
6.....	1 21	4 5	2 49*	25 0	4 50	128 0	0 62	0 9	0 62	0 9
7.....	0 98	2 5	1 35	5 5	3 50	56 0	0 61	0 8	0 62	0 9
8.....	0 92	2 0	0 66	0 6	2 27	20 0	0 61	0 8	0 61	0 8
9.....	0 85	1 5	0 65	0 6	1 71	10 6	0 61	0 8	0 61	0 8
10.....	0 92	2 0	0 65	0 6	1 55	8 6	0 61	0 8	0 61	0 8
11.....	0 85	1 5	0 66	0 7	0 93	2 6	0 61	0 8	0 60	0 8
12.....	0 81	1 3	0 63	0 5	0 82	1 9	0 60	0 8	0 60	0 8
13.....	0 78	1 0	0 60	0 5	0 74	1 4	0 60	0 8	0 60	0 8
14.....	0 74	0 9	0 60	0 5	0 65	1 0	0 60	0 8	0 60	0 8
15.....	0 70	0 7	0 59	0 5	0 64	1 0	0 60	0 8	0 60	0 8
16.....	0 70	0 6	0 58	0 5	0 63	0 9	0 60	0 8		
17.....	0 70	0 6	0 57	0 4	0 63	0 9	0 61	0 8		
18.....	0 70	0 6	0 57	0 4	0 62	0 9	0 61	0 8		
19.....	0 70	0 6	0 57	0 4	0 62	0 9	0 61	0 8		
20.....	0 70	0 5	0 57	0 4	0 62	0 9	0 62	0 9		
21.....	0 70	0 5	0 56	0 4	0 62	0 9	0 62	0 9		
22.....	0 70	0 5	0 56	0 4	0 64	1 0	0 62	0 9		
23.....	0 70	0 5	0 56	0 4	0 64	1 0	0 62	0 9		
24.....	0 69	0 5	0 56	0 4	0 64	1 0	0 62	0 9		
25.....	0 69	0 5	0 56	0 4	0 64	1 0	0 62	0 9		
26.....	0 68	0 5	0 56	0 4	0 64	1 0	0 62	0 9		
27.....	0 68	0 5	0 56	0 4	0 63	0 9	0 62	0 9		
28.....	0 68	0 5	0 56	0 4	0 63	0 9	0 62	0 9		
29.....	0 67	0 5	0 55	0 4	0 63	0 9	0 62	0 9		
30.....	0 67	0 5	0 55	0 4	0 63	0 9	0 62	0 9		
31.....	0 67	0 5	0 55	0 4			0 62	0 9		

* Heavy rain in hills.

NOTE—Could not use gauge heights previous to April 1st because of considerable ice in channel. Shifting conditions occurred between June 12 and Aug 11.

A part of above run-off was impounded by Wright's and McKinnon's dams below.

MONTHLY DISCHARGE of Middle Creek at McKinnon's Ranche, Alta., for 1911.

Drainage area, 123 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile	Depth in Inches on Drainage Area.	Total in Acre-Feet.
April.....	156 0	2 2	18 6	0 151	0 168	1,107
May.....	3 8	0 7	1 1	0 009	0 010	68
June.....	39 0	0 5	4 8	0 038	0 042	286
July.....	60 0	0 5	5 1	0 041	0 047	314
August.....	25 0	0 4	1 4	0 011	0 013	80
September.....	128 0	0 4	8 4	0 068	0 076	500
October.....	1 0	0 8	0 9	0 007	0 008	55
November (1-15).....	0 9	0 8	0 8	0 007	0 004	24
The period.....					0 368	2,434

NOTE—Springs just above kept the creek running continuously at the station though it went dry both above and below.

MIDDLE CREEK AT ROSS'S RANCHE.

This station was established July 20, 1908, by H. R. Carscallen. It is located on the S.W. 1/4 Sec. 30, Tp. 5, Rge. 29, W. 3rd Mer., about four miles southwest of Battle Creek post office.

The channel is straight for 50 feet above and below the station. The right bank is high, but the left is low and liable to overflow in flood stages of the stream. The bed of the stream is composed of sand and coarse gravel with a little vegetation at the station, and may shift slightly during high water. There is only one channel at low stages, but in extreme flood stages, water breaks out over the left bank and forms two channels. The current is sluggish at low stages and moderate at higher stages.

Discharge measurements are made by wading at ordinary stages, and at very low stages a weir is used. The initial point for soundings is a square stake driven close to the ground on the left bank, marked "I.P.," and surrounded with a few stones.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a pine post sunk in the bed of the stream at the left bank and securely stayed. The zero of the gauge (elev., 93.62) is referred to a permanent iron bench-mark (assumed elev., 100.00), situated on the right bank 123 feet from the initial point and in line with the regular section. The bench-mark is about one foot above ground and is protected by a mound of stones. During 1911, the gauge was read by Maurice Ross.

The stream would be dry most of the summer at this station if it were not for the discharge of a few springs a short distance above. A part of the run-off of the drainage basin above this station is held by dams at Wright's and McKinnon's ranches and used for irrigation purposes.

DISCHARGE MEASUREMENTS of Middle Creek at Ross's Ranche, Sask., in 1911.

Date	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft</i>
April 24.....	M. H. French.....	9.2	5.97	0.336	0.72	2.01
May 20.....	do	9.0	3.89	0.095	0.51	0.37
June 12.....	do	8.5	3.89	0.073	0.54	0.28
July 20.....	do	8.8	5.24	0.062	0.56	0.33
Sept. 1.....	do		5.06	0.063	0.57	0.32
Sept. 7.....	do	12.0	24.26	2.499	2.36	60.64
Sept. 8.....	do	13.4	28.48	2.852	2.68	81.25
Sept. 30.....	do	9.0	5.57	0.088	0.60	0.49

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Middle Creek, at Ross's Ranche, Sask., for 1911.

Day.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	.....	.....	1.05	6.1	0.54	0.3	1.30	12.0
2.....	.....	.....	1.03	5.7	0.54	0.3	1.10	7.2
3.....	.....	.....	0.70	1.3	0.54	0.3	0.90	3.5
4.....	.....	.....	0.60	0.5	0.54	0.3	1.80	30.0
5.....	.....	.....	0.60	0.5	0.54	0.3	1.70	26.0
6.....	.....	.....	0.56	0.4	0.54	0.3	1.48	17.0
7.....	.....	.....	1.53	19.0	0.54	0.3	1.20	9.6
8.....	.....	.....	1.30	12.0	0.54	0.3	0.99	4.9
9.....	.....	.....	1.30	12.0	0.54	0.3	0.70	1.3
10.....	.....	.....	1.30	12.0	0.54	0.3	0.59	0.5
11.....	0.74	1.7	1.30	12.0	0.54	0.3	0.50	0.5
12.....	1.10	7.2	1.00	5.0	0.54	0.3	0.55	0.4
13.....	3.10	*114.0	0.80	2.3	0.54	0.3	0.55	0.4
14.....	2.00	40.0	0.60	0.5	0.54	0.3	0.55	0.4
15.....	1.30	12.0	0.55	0.4	0.54	0.3	0.55	0.4
16.....	0.79	2.2	0.55	0.4	0.54	0.3	0.55	0.4
17.....	0.79	2.2	0.55	0.4	0.54	0.3	0.56	0.4
18.....	0.79	2.2	0.55	0.4	0.54	0.3	0.56	0.4
19.....	0.80	2.3	0.54	0.3	0.54	0.3	0.56	0.4
20.....	0.90	3.5	0.53	0.3	0.54	0.3	0.57	0.4
21.....	1.30	12.0	0.54	0.3	0.55	0.4	0.57	0.4
22.....	3.12	116.0	0.54	0.3	0.60	0.5	0.57	0.4
23.....	1.70	26.0	0.55	0.4	0.60	0.5	0.57	0.4
24.....	0.90	3.5	0.54	0.3	0.60	0.5	0.57	0.4
25.....	1.02	5.4	0.53	0.3	0.60	0.5	0.57	0.4
26.....	1.05	6.1	0.53	0.3	0.61	0.6	0.57	0.4
27.....	1.05	6.1	0.53	0.3	0.61	0.6	0.57	0.4
28.....	1.07	6.5	0.54	0.3	0.62	0.7	0.57	0.4
29.....	1.09	7.0	0.54	0.3	0.95	4.2	0.57	0.4
30.....	1.20	9.6	0.55	0.4	1.11	7.4	0.57	0.4
31.....	.....	.....	0.54	0.3	.....	.....	0.57	0.4

DAILY GAUGE-HEIGHT AND DISCHARGE of Middle Creek at Ross's Ranche, Sask., for 1911.—*Con.*

Day.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0 57	0 4	0 57	0 4	0 60	0 5	0 60	0.5
2	0 57	0 4	0 57	0 4	0 60	0 5	0 60	0.5
3	0 57	0 4	0 57	0 4	0 60	0 5	0 60	0.5
4	0 57	0 4	0 80	2 3	0 60	0 5	0 60	0.5
5	0 57	0 4	1 20	9 6	0 60	0 5	0 60	0.5
6	0 60	0 5	3 02	107 0	0 60	0 5	0 60	0 5
7	0 60	0 5	2 36	61 0	0 60	0 5	0 60	0 5
8	0 60	0 5	2 69	82 0	0 60	0 5	0 60	0.5
9	0 60	0 5	2 30	57 0	0 60	0 5		
10	0 60	0 5	2 00	40 0	0 60	0 5		
11	1 00	5 0	1 45	16 0	0 60	0 5		
12	0 80	2 3	1 00	5 0	0 60	0 5		
13	0 70	1 3	0 90	3 5	0 60	0 5		
14	0 61	0 6	0 85	2 9	0 60	0 5		
15	0 60	0 5	0 81	2 4	0 60	0 5		
16	0 59	0 5	0 74	1 7	0 60	0 5		
17	0 58	0 4	0 60	0 5	0 60	0 5		
18	0 57	0 4	0 60	0 5	0 60	0 5		
19	0 57	0 4	0 60	0 5	0 60	0 5		
20	0 57	0 4	0 60	0 5	0 60	0 5		
21	0 57	0 4	0 60	0 5	0 60	0 5		
22	0 57	0 4	0 60	0 5	0 60	0 5		
23	0 57	0 4	0 60	0 5	0 60	0 5		
24	0 57	0 4	0 60	0 5	0 60	0 5		
25	0 57	0 4	0 60	0 5	0 60	0 5		
26	0 57	0 4	0 60	0 5	0 60	0 5	....
27	0 57	0 4	0 60	0 5	0 60	0 5		
28	0 57	0 4	0 60	0 5	0 60	0 5		
29	0 57	0 4	0 60	0 5	0 60	0 5		
30	0 57	0.4	0 60	0 5	0 60	0 5		
31	0 57	0 4			0 60	0 5		

* Sudden rise due to failure of dykes at Wright's ranche.
NOTE—There was considerable rain during the latter part of June but most of the water appears to have been held up by Wright's and McKinnon's dams.

MONTHLY DISCHARGE of Middle Creek at Ross's Ranche, Sask., for 1911.

Drainage area, 173 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet
April (11-30)	116.0	1.7	19.3	0.112	0.083	766
May	19.0	0.3	3.1	0.018	0.021	191
June	7.4	0.3	0.7	0.004	0.004	42
July	30.0	0.4	3.9	0.023	0.025	240
August	5.0	0.4	0.7	0.004	0.005	43
September	107.0	0.4	13.3	0.077	0.086	791
October	0.5	0.5	0.5	0.003	0.004	31
November (1-8)	0.5	0.5	0.5	0.003	0.001	8
The period					.229	2,112

NOTE—Springs just above this station keep water flowing at this point throughout dry periods though the creek was dry above the springs, and a distance below the station due to loss by evaporation and see page.

MIDDLE CREEK AT HAMMOND'S RANCHE.

This station was established June 13, 1910, by H. R. Carscallen. It is located at Hammond's ranche, on the N.W. ¹/₄ Sec. 4, Tp. 2, Rge. 29, W. 3rd Mer., about seven miles above the Willow Creek police detachment and about one quarter of a mile above the junction of Middle and Lodge Creeks.

SESSIONAL PAPER No. 25d

The channel is straight for 200 feet above and 125 feet below the station. Both banks are high and fairly steep, free from brush and not liable to overflow. The bed of the stream is sandy and may shift at high stages. The station, being located only a short distance above the junction with Lodge Creek, may be affected by backwater from that creek during high-water stages.

Discharge measurements are made at the station by wading, and at extreme low stages a weir may be used. High-water measurements are not attainable, as there is no structure at or near the station to support the engineer in taking the gaugings when the water becomes too deep for wading. The initial point for soundings is a stake driven close to the ground on the left bank and marked "I.P."

The gauge is a plain staff graduated to feet and hundredths, spiked to a post sunk in the bed of the creek near the left bank. The zero of the gauge (elev., 87.60) is referred to a permanent iron bench-mark (assumed elev., 100.00) upon the left bank. The bench-mark is about six inches above ground and is protected by a mound of stones. It is also used as the initial point for soundings.

During 1911, the gauge was read by Mrs. D. A. Hammond.

DISCHARGE MEASUREMENTS of Middle Creek at Hammond's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 20.....	M. H. French.....	9.5	25.38	0.312	1.94	7.94
May 17.....	do.....	17.8	17.68	0.096	1.50	1.70
Aug. 8.....	do.....	15.2	9.87		1.04	Nil.
July 7.....	do.....	19.2	36.00	0.669	2.71	24.30
Sept. 16.....	do.....	19.0	21.10	0.381	1.975	8.04
Oct. 23.....	do.....	18.8	11.18	0.062	1.40	0.70

DAILY GAUGE-HEIGHT AND DISCHARGE of Middle Creek at Hammond's Ranche, Sask., for 1911.

Day.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.52	2.2	1.66	3.6	1.47	1.7
2.....			1.52	2.2	1.74	4.6	1.47	1.7
3.....			1.52	2.2	2.55	20.0	1.47	1.7
4.....			1.52	2.2	2.20	13.0	1.46	1.6
5.....			1.52	2.2	2.05	10.0	1.50	2.0
6.....			1.71	4.2	2.12	11.0	1.48	1.8
7.....			1.70	4.0	1.94	7.8	1.46	1.6
8.....			1.40	1.0	1.80	5.5	1.40	1.0
9.....			1.38	0.8	1.80	5.5	1.34	0.4
10.....			1.38	0.8	1.67	3.7	1.30	Nil.
11.....			1.42	1.2	1.42	1.2	1.25	"
12.....			1.45	1.5	1.43	1.3	1.25	"
13.....			1.67	3.7	1.29	0.0	1.25	"
14.....	1.06	Nil.	1.68	3.8	1.42	1.2	1.25	"
15.....	1.09	"	1.72	4.3	1.46	1.6	1.25	"
16.....	1.04	"	2.70	*24.0	1.48	1.8	1.25	"
17.....	1.05	"	2.70	24.0	1.52	2.2	1.25	"
18.....	1.02	"	2.36	16.0	1.51	2.1	1.25	"
19.....	1.01	"	1.96	8.2	1.51	2.1	1.25	"
20.....	1.03	"	1.94	7.8	1.51	2.1	2.10	11.0
21.....	1.01	"	1.80	5.5	1.50	2.0	2.10	11.0
22.....	1.01	"	1.36	0.6	1.50	2.0	1.90	7.0
23.....	1.05	"	3.04	*34.0	1.52	2.2	1.72	4.3
24.....	1.05	"	2.70	24.0	1.52	2.2	1.70	4.0
25.....	2.27	14.0	2.06	10.0	1.52	2.1	1.57	2.7
26.....	2.35	16.0	1.95	8.0	1.51	2.1	1.50	2.0
27.....	2.05	10.0	1.90	7.0	1.51	2.1	1.50	2.0
28.....	2.07	10.0	1.90	7.0	1.50	2.0	1.48	1.8
29.....	2.04	10.0	1.98	8.6	1.45	1.5	1.48	1.8
30.....	1.94	7.8	1.70	4.0	1.47	1.7	1.48	1.8
31.....	1.96	8.2			1.50	2.0		

DAILY GAUGE-HIGHT AND DI-CHARGE of Middle Creek at Hammond's Ranche, Sask.,
for 1911.—Continued.

Day.	July		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1 48	1 8	Dry.	Nil.	Dry.	Nil.	1.52	2 2	1.40	1.0
2.....	1 48	1 8					1.52	2 2	1.40	1 0
3.....	1 52	2 2					1 51	2 1	1.40	1.0
4.....	3 00	a33 0			1 70	4.0	1.51	2 1	1.40	1 0
5.....	2 46	18 0			1 95	8.0	1.51	2 1	1 40	1.0
					9 20	a452.0	1.50	2 0	1 40	1.0
6.....	2 20	13 0								
7.....	2 74	25 0			7 45	284.0	1 50	2 0	1.40	1.0
8.....	2 30	15 0			6 30	195 0	1 49	1 9	1.40	1 0
9.....	2 28	15 0			4 45	88 0	1.49	1 9	1 40	1 0
10.....	2 19	13 0			4 14	74.0	1.49	1 9	1.40	1.0
11.....	2 15	12 0			3 95	66.0	1.48	1 8	1.40	1 0
12.....	1 97	8 4			3 20	39.0	1.47	1 7	1.40	1 0
13.....	1 81	5 6			2 45	18.0	1.46	1 6	1.40	1.0
14.....	1 72	4 3			2 42	17.0	1 45	1 5	1.40	1 0
15.....	1 60	3 0			2 37	16.0	1.44	1 4	1.40	1 0
16.....	1 56	2 6			1 99	9.0	1.44	1 4	1.40	1 0
17.....	1 56	2 6			1 87	6.6	1.43	1 3	1.40	1.0
18.....	1 53	2 3			1 79	5.4	1.43	1 3	1.40	1 0
19.....	1 52	2 2			1 70	4.0	1.42	1 2	1.40	1.0
20.....	1 51	2 1			1 68	3.8	1.42	1 2	1.40	1 0
21.....	1 47	1 7			1 67	3.7	1.41	1 1		...
22.....	1 44	1 4			1 65	3.5	1.41	1 1		...
23.....	1 40	1 0			1 67	3.7	1.40	1 0		...
24.....	1 37	0 7			1 66	3.6	1.40	1 0		...
25.....	Dry.	Nil.			1 65	3.5	1.40	1 0		...
26.....					1 59	2.9	1.40	1 0		...
27.....					1 58	2.8	1.40	1 0		...
28.....					1 56	2.6	1.40	1 0		...
29.....					1 55	2.5	1.40	1 0		...
30.....					1 53	2.3	1.40	1 0		...
31.....							1.40	1 0	....	...

* Wright's dykes gave way.
a Heavy rains.

NOTE—Although the gauge heights for September 6, 7 and 8, are correct, backwater from Lodge Creek might be partly responsible for the high readings.

MONTHLY DISCHARGE of Middle Creek at Hammond's Ranche, Sask., for 1911.

Drainage area, 301 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.		
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet.
March (14-31).....	16.0	0.0	4.2	0.014	0.009	150
April.....	34.0	0.8	7.5	0.025	0.028	446
May.....	20.0	0.0	3.9	0.013	0.015	240
June.....	11.0	0.0	2.1	0.007	0.008	125
July.....	33.0	0.0	6.1	0.020	0.023	375
August.....						
September.....	452.0	0.0	44.0	0.146	0.163	2,618
October.....	2.2	1.0	1.5	0.005	0.006	92
November (1-20).....	1.0	1.0	1.0	0.003	0.002	40
The period.....					0.254	4,086

LODGE CREEK AT WILLOW CREEK POLICE DETACHMENT.

This station was established on August 13, 1909, by F. H. Peters. It is located on the S.E. ¼ Sec. 12, Tp. 1, Rge. 29, W. 3rd Mer., and about 500 feet east of the house at Willow Creek

SESSIONAL PAPER No. 25d

police detachment. It is about 75 miles by trail from Maple Creek, and about 35 miles by trail south of Battle Creek post office.

The stream flows in one channel, which is straight for about 200 feet above and 150 feet below the station. The right bank is steep, composed of solid clay and not liable to overflow. The left bank gradually rises, is composed of solid clay and stones, and not liable to overflow.

During ordinary stages of flow, discharge measurements are made by wading, and at very low stages a weir is used. It is impossible at present to obtain high-water measurements as there is no bridge or other structure from which the hydrographer may work.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the left bank. The zero of the gauge (elev., 2721.18) is referred to a concrete bench-mark (elev., 2768.00 above mean sea-level) which was set by the International Boundary survey, upon a hill about 500 feet west of the gauge.

During 1911, the gauge was read until July 1, by Constable C. H. Cuthbertson, and after that by William Tudgay.

DISCHARGE MEASUREMENTS of Lodge Creek at Willow Creek Police Detachment, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 19.....	M. H. French.....	65.0	52.50	2.050	2.93	107.70
May 12.....	do.....	20.2	13.08	0.608	1.65	7.96
June 6.....	do.....	18.2	7.40	0.234	1.41	1.73*
July 8.....	do.....	22.0	23.40	1.139	2.04	26.66
Aug. 7.....	do.....				1.05	Nil.
Sept. 18.....	do.....	21.0	14.86	0.836	1.75	12.42

* Weir measurement.

DAILY GAUGE-HEIGHT AND DISCHARGE of Lodge Creek at Willow Creek Police Detachment, Sask., for 1911.

Day.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			4.35	377	2.20	57.0	1.44	2.8
2.....			4.22	345	2.22	38.0	1.48	3.6
3.....			4.12	321	2.48	50.0	1.44	2.8
4.....			3.58	207	2.35	48.0	1.41	2.2
5.....			3.20	144	2.22	38.0	1.37	1.7
6.....			2.50	103	2.18	36.0	1.38	1.8
7.....			2.88	101	2.10	50.0	1.42	2.4
8.....			2.88	101	2.08	20.0	1.42	2.4
9.....			2.82	93	2.05	26.0	1.40	2.0
10.....			2.65	75	2.08	20.0	1.40	2.0
11.....			2.58	68	1.70	11.0	1.38	1.8
12.....			2.52	63	1.70	11.0	1.34	1.4
13.....			2.50	61	1.61	7.4	1.33	1.3
14.....			2.70	80	1.61	7.4	1.30	1.0
15.....			3.23†	149	1.57	6.1	1.30	1.0
16.....			2.95	110	1.61	7.4	1.32	1.2
17.....	1.15	0.0	2.88	101	1.61	7.4	1.30	1.0
18.....	1.50	1.0	2.98	113	1.55	5.5	1.30	1.0
19.....	1.25	0.5	3.08	127	1.52	4.6	1.30	1.0
20.....	1.15	0.0	2.22	58	1.40	3.2	1.30	1.0
21.....	1.20	0.0	2.20	37	1.50	4.0	1.30	1.0
22.....	1.42	2.4	2.32	40	1.50	4.0	1.30	1.0
23.....	1.52	4.6	2.35	48	1.49	3.8	1.20	0.9
24.....	1.75	13.0	2.32	46	1.49	3.8	2.00	70.0
25.....	1.53	4.0	2.55	66	1.52	4.6	2.70	80.0
26.....	2.02	24.4	2.25	40	1.50	4.0	2.42	54.0
27.....	2.20	37.0	2.15	34	1.48	3.6	2.30	44.0
28.....	2.20	37.0	2.15	34	1.50	4.0	2.48	59.0
29.....	5.30†	684.0	2.15	34	1.52	4.6	2.81	92.0
30.....	5.28†	660.0	2.15	34	1.50	4.0	2.46	57.0
31.....	5.23†	644.0	..	....	1.52	4.6		

DAILY GAUGE-HIGHT AND DISCHARGE of Lodge Creek at Willow Creek Police Detachment, Sask., for 1911.—Continued.

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2 33	46 0	0 99	Nil.	0 55	Nil	1 50	4 0	1 30	1 0
2	2 25	40 0	0 99		0 50		1 48	3 6	1 30	1 0
3...	2 32	46 0	0 99		0 50		1 46	3 2	1 30	1 0
4	4 12	* 21 0	0 99		1 18		1 45	3 0	1 32	1 2
5...	3 12	133 0	0 98		1 85	17 0	1 45	3 0	1 32	1 2
6..	2 74	84 0	0 98		7 44	1,550 0	1 44	2 8	1 32	1 2
7...	2 10	30 0	1 00		8 00	1,800 0	1 44	2 8	1 33	1 3
8...	2 20	37 0	1 01		5 98	918 0	1 43	2 6	1 33	1 3
9...	1 52	20 0	1 01		3 80	240 0	1 43	2 6	1 34	1 4
10...	1 96	21 0	1 00		3 13	134 0	1 42	2 4	1 35	1 5
11	1 70	11 0	1 00		2 66	76 0	1 40	2 0	1 35	1 5
12	1 76	13 0	1 02		2 34	47 0	1 39	1 9	1 34	1 4
13	1 70	11 0	1 02		2 26	41 0	1 37	1 7	1 34	1 4
14	1 59	6 7	1 01		2 05	26 0	1 35	1 5	1 34	1 4
15...	1 58	6 4	1 00		1 98	22 0	1 35	1 5	1 34	1 4
16	1 57	6 1	0 99		1 86	17 0	1 34	1 4		
17...	1 55	5 5	0 95		1 86	17 0	1 34	1 4		
18...	1 51	4 3	0 91		1 75	13 0	1 33	1 3		
19	1 50	4 0	0 87		1 70	11 0	1 33	1 3		
20	1 46	3 2	0 80		1 64	8 6	1 32	1 2		
21	1 39	1 9	0 78		1 57	6 1	1 32	1 2		
22	1 28	0 8	0 74		1 60	7 0	1 31	1 1		
23	1 25	0 5	0 72		1 62	7 8	1 30	1 0		
24...	1 19	Nil.	0 70		1 56	5 8	1 30	1 0		
25...	1 15		0 65		1 55	5 5	1 30	1 0		
26..	1 10		0 62		1 54	5 2	1 30	1 0		
27	1 07		0 59		1 54	5 2	1 30	1 0		
28...	1 06		0 55		1 54	5 2	1 30	1 0		
29	1 05		0 50		1 53	4 9	1 30	1 0		
30	1 02		0 44	....	1 51	4 3	1 30	1 0		
31...	0 98		0 40				1 30	1 0		

* Heavy rain.
† Spring thaw.
‡ Doubt accuracy of these gauge heights.

MONTHLY DISCHARGE of Lodge Creek at Willow Creek Police Detachment, Sask., for 1911.
Drainage area, 803 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet.
March (17-31). . .	684.0	0.0	141.1	0.176	0.098	4,198
April.....	377.0	34.0	106.5	0.133	0.148	6,337
May	59.0	3.2	15.7	0.020	0.023	965
June.....	92.0	0.9	16.5	0.020	0.022	982
July.....	321.0	0.0	27.5	0.034	0.039	1,691
August.....						
September.....	1,830.0	0.0	167.8	0.209	0.223	9,985
October.....	4.0	1.0	1.8	0.002	0.002	111
November (1-15).	1.5	1.0	1.3	0.002	0.001	39
The period.....					0.556	24,308



Forest along Headwaters of Battle Creek, which helps to hold back the snow water until late in Summer. Taken by M. H. French.

MISCELLANEOUS DISCHARGE MEASUREMENTS in Lodge Creek Drainage Basin, in 1911.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Dis-charge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Feet per Sec.</i>	<i>Sec.-ft.</i>
May 17	M. H. French.	Lodge Creek.....	Sec. 4-2-29-3.		4 89	0 680	3 330
June 8	"	"	"				1 935
Sept. 8	W. A. Fletcher	"	N.E. 24-2-30-3.	44 0	78 40	2 840	222 400
April 25	M. H. French.	Lodge Creek (East Br)	Sec. 25-6-3-4...	10 0	3 11	1 570	4 900
May 22	"	"	" 22-6-3-4...	5 7	2 55	1 120	2 870
June 13	"	"	"				0 055
April 21	"	Middle Creek.....	" 3-4-29-3.	x			1 520
April 29	"	"	" 14-6-2-4.	x			1 230
May 23	"	" (East Br.)	" 14-6-2-4.				1 080
April 29	"	Mitchell Creek.....	" 13-6-2-4.	x			0 490
May 22	"	"	"	9 0	6 25	0 619	3 870
April 28	"	Read Creek.....	" 34-6-3-4.	5 3	2 45	0 320	0 290
May 22	"	"	"				0 362
June 13	"	"	"				0 080
May 22	"	Sexton Creek.....	" 21-7-3-4				0 551
June 13	"	"	"				0 167
June 13	"	Spring Creek.....	" 22-5-2-4				0 118
July 21	"	"	"	x			0 190

x Weir measurements.

BATTLE CREEK DRAINAGE BASIN.

General Description.

Battle Creek rises in Tp. 8, Rge. 2, W. 4th Mer., and flows in an easterly direction for about eight miles, where it crosses the fourth meridian, then turns in a southeasterly direction and crosses the International Boundary in Sec. 3, Tp. 1, Rge. 26, W. 3rd Mer., eventually emptying into Milk River near Chinook, Montana. As is characteristic of the streams in this locality, the valley is narrow and deep near the source and gradually broadens out into large flats and meadows. These large flats are first noticed in the vicinity of Battle Creek post office. Near the head of the stream the valley is well wooded with fair-sized timber, but this diminishes to a growth of willow brush along the banks and finally disappears altogether.

The chief tributaries of Battle Creek are Tenmile Creek, joining it in Sec. 4, Tp. 6, Rge. 26 W. 3rd Mer., and Sixmile Coulee, joining it in Sec. 21, Tp. 6, Rge. 29, W. 3rd Mer. Stations have been established on both of these streams.

There are three stations on Battle Creek at the following places:—Nashe's ranche, Wilson's ranche and Tenmile police detachment.

Although it will be several years before it reaches its fullest development, the irrigation of the flats along the creek is increasing every season. This, it is expected, will result in a more uniform flow in the creek, as a certain amount of the water diverted by the irrigation ditches will be returned to the creek through seepage.

The principal irrigation schemes under developemnt at the present time are Marshall and Gaff's near Battle Creek post office, Richardson's, McKinnon's, Stirling's, and Nashe's near Kelvinhurst post office.

CHEESEMAN DITCH NEAR COULEE.

This station was established on June 24, 1911, by W. A. Fletcher. It is located in the S.W. 1/4 Sec. 12, Tp. 8, Rge. 29, W. 3rd Mer., about fifty yards from Ben Cheeseman's house.

The channel is straight for 40 feet above and 30 feet below the station. The bottom of the ditch is composed of clay.

The gauge, which is a plain board divided into feet and inches, is nailed to a post at the left bank. The zero (elevation, 96.005) is referred to a bench-mark (assumed elevation, 100.00) six feet southwest of the gauge. Discharge measurements are made with a weir.

No records were obtained at this station during 1911.

SIXMILE COULEE AT SODERSTROM'S RANCHE.

This station was established July 2, 1909, by H. R. Carscallen. It is located on Sec. 29, Tp. 7, Rge. 28, W. 3rd Mer., 200 yards west of the surveyed trail from Maple Creek to Tenmile and about thirty miles south of Maple Creek.

The channel is straight for 50 feet above and 20 feet below the station. Both banks are high and not liable to overflow. The right bank is sparsely covered with brush; the left bank is free of brush. The bed of the stream is composed of sand and very coarse gravel with clay at the banks. The current is moderate. A small amount of vegetation is present at the station.

Discharge measurements are made at or near the station by wading, and at very low stages a weir is used. The initial point for soundings is a square stake driven close to the ground on the left bank and marked "I.P." in red paint.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to an upright post sunk in the bed of the creek at the right bank, and securely stayed to the bank. The gauge is referred to bench-marks as follows:— (1) A nail-head driven into the top of a pointed willow stump on the right bank, about 150 feet upstream from the gauge, the stump blazed and marked "B.M." in red paint; (elevation, 7.77 feet above gauge zero.) (2) Nail-heads in the top of a log near the ground at the southeast corner of Mr. Soderstrom's north stable (elevation, 18.08 feet above gauge zero.)

During 1911, the gauge was read by J. M. Soderstrom until June 10, when he moved away, and another observer could not be secured.

DISCHARGE MEASUREMENTS of Sixmile Coulee at Soderstrom's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 1.....	M. H. French.....	20.0	24.20	0.733	2.43	17.75
May 27.....	do.....	17.0	19.24	0.582	2.25	11.21
June 19.....	do.....	4.0	2.84	0.612	0.98	1.74
June 30.....	do.....	6.0	13.80	0.490	1.95	6.77
Sept. 13.....	do.....	26.0	28.00	0.659	2.76	18.45

DAILY GAUGE-HEIGHT AND DISCHARGE of Sixmile Coulee at Soderstrom's Ranche, for 1911.

	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.39	13.1	2.40	13.2	1.86	6.7
2.....	2.39	13.1	2.28	11.5	1.82	6.4
3.....	2.39	13.1	2.23	10.9	1.78	6.0
4.....	2.39	13.1	2.10	9.3	1.76	5.8
5.....	2.39	13.1	1.98	7.9	1.74	5.7
6.....	2.39	13.1	1.78	6.0	1.72	5.5
7.....	2.39	13.1	1.76	5.8	1.70	5.3
8.....	2.49	14.6	1.74	5.7	2.00	8.1
9.....	2.59	16.3	1.70	5.3	1.90	7.1
10.....	2.33	12.2	1.68	5.2	1.88	6.9
11.....	2.33	12.2	1.78	6.0	.....	.....
12.....	2.33	12.2	1.76	5.8	.....	.....
13.....	2.32	12.1	1.74	5.7	.....	.....
14.....	2.34	12.4	1.72	5.5	.....	.....
15.....	2.36	12.6	1.90	7.1	.....	.....
16.....	2.50	14.8	2.00	8.1	.....	.....
17.....	2.45	14.0	1.90	7.1	.....	.....
18.....	2.59	16.3	1.80	6.2	.....	.....
19.....	2.49	14.6	1.76	5.8	.....	.....
20.....	2.45	14.0	1.80	6.2	.....	.....
21.....	2.35	12.5	1.80	6.2	.....	.....
22.....	2.35	12.5	1.78	6.0	.....	.....
23.....	2.35	12.5	1.76	5.8	.....	.....
24.....	2.30	11.8	1.80	6.2	.....	.....
25.....	2.10	9.3	2.27	11.4	.....	.....
26.....	2.03	8.5	2.20	10.5	.....	.....
27.....	2.00	8.1	2.18	10.3	.....	.....
28.....	2.00	8.1	2.14	9.8	.....	.....
29.....	2.45	14.0	2.04	8.6	.....	.....
30.....	3.20	29.1	2.00	8.1	.....	.....
31.....	.....	.....	1.90	7.1	.....	.....

SESSIONAL PAPER No. 25d

MONTHLY DISCHARGE of Sixmile Coulee at Soderstrom's Ranche, Sask., for 1911.

Drainage area, 27 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet
April	29.1	8.1	13.2	0.489	0.546	786
May	13.2	5.2	7.6	0.281	0.324	467
June 1-10	8.1	5.3	6.4	0.237	0.088	127
The period					0.958	1,380

SPANGLER'S DITCH NEAR BATTLE CREEK.

This station was established on July 10, 1911, by W. A. Fletcher. It is located in Sec. 6, Tp. 7, Rge. 28, W. 3rd Mer., about one half mile north of J. M. Spangler's house. This ditch is above the regular station on Sixmile coulee at Spangler's ranche.

The channel is straight for 40 feet above and 30 feet below the station. The bottom of the ditch is composed of clay.

The zero of the gauge (elevation, 96.30) is referred to a bench-mark (assumed elevation, 100.00), which is located just back of the gauge.

Discharge measurements are made with a current-meter or weir.

DISCHARGE MEASUREMENTS of Spangler's Ditch near Battle Creek, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Inches	Sec.-ft.
July 4.....	M. H. French.....	0.0	2.84	1.130	....	3.21
July 31.....	do	4.5	1.34	0.111	8	1.50x

x Weir measurement.

SIXMILE COULEE AT SPANGLER'S RANCHE.

This station was established July 4, 1911, by M. H. French. It is located about 1000 feet east of J. M. Spangler's house on the N.W. ¼ Sec. 36, Tp. 6, Rge. 29, W. 3rd Mer., and is about 34 miles by trail southwest of Maple Creek and six miles north of Battle Creek post office.

The channel is straight for about fifty feet above and below the station. The banks are covered with brush, which cause back-water in a portion of the cross-section during flood stage. The bed of the stream is composed of sand and gravel, and is not liable to shift. The current is swift at all stages.

Discharge measurements are made near the gauge, in low water by wading, and at a bridge 2000 feet upstream during high water. The initial point for soundings is a four-nich post on the right bank 562 feet from the bench mark on the left bank.

The gauge is a plain staff graduated to feet and hundredths, nailed vertically to a post sunk in the bed of the stream near the left bank. The zero of the gauge (elev., 90.68) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated on the left bank and used as the final point for soundings. The gauge was read, during 1911, by Carl Spangler.

This station is about three quarters of a mile below the Spangler irrigation ditch, which diverted a small amount of water from the creek during July and August, in 1911.

DISCHARGE MEASUREMENTS of Sixmile Coulee at Spangler's Rancho, Sask., in 1911.

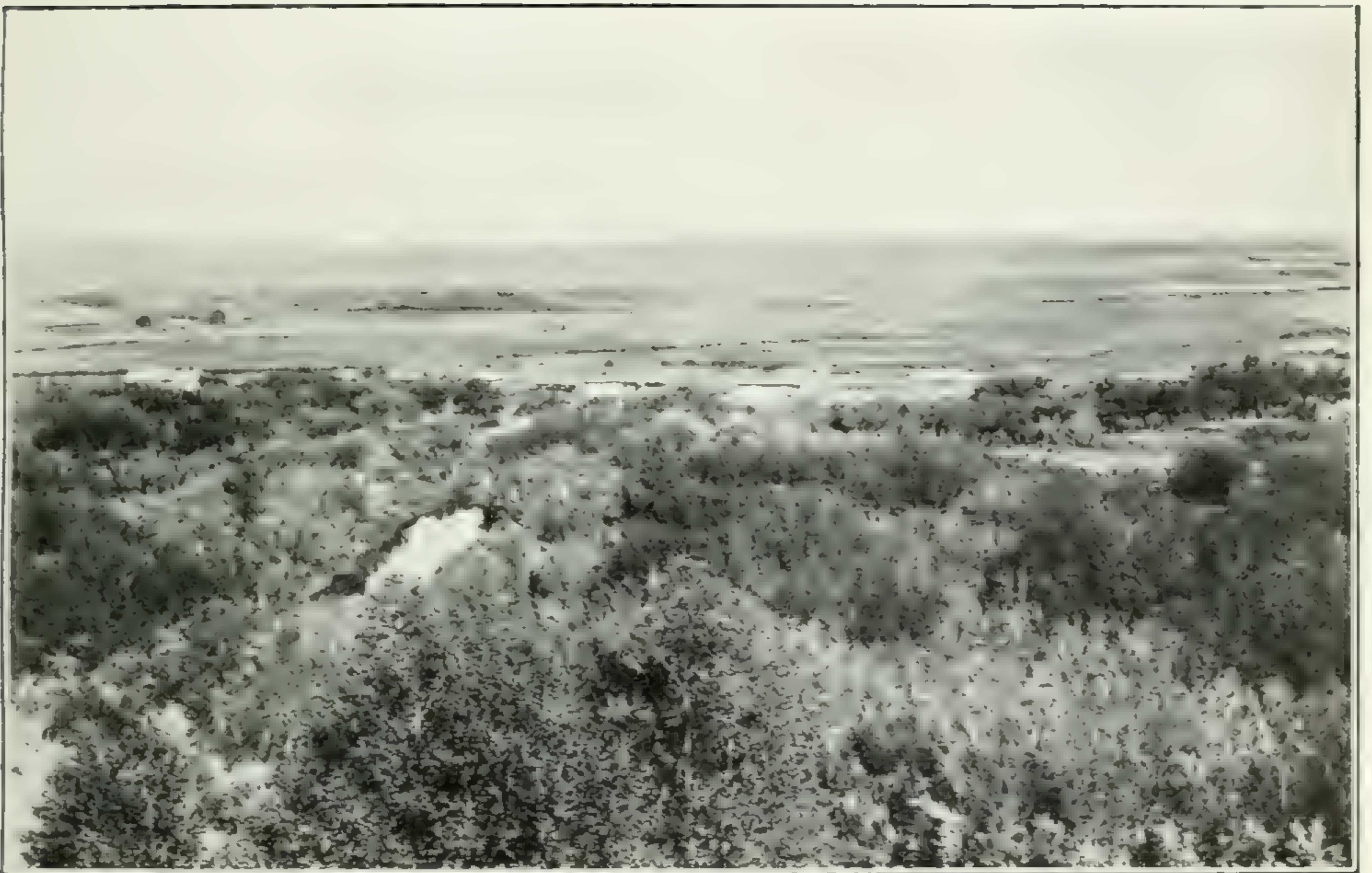
Date.	Hydrographer.	Width.	Area of Section	Mean Velocity	Gauge Height	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 3.....	M. H. French	5.5	3.77	0.947	1.26	3.59
July 4.....	do	5.3	3.44	0.849	1.29	2.92
July 31.....	do	4.6	1.37	0.330	0.73	0.46*
Aug. 22.....	do	5.0	1.15	0.195	0.75	0.22*
Sept. 8.....	do	15.0	84.64	0.824	5.69	69.77
Sept. 14.....	do	11.5	18.50	1.000	3.00	18.46
Oct. 30.....	do	5.7	4.68	0.961	1.55	4.50

* Discharge determined by means of a weir and referred to the regular cross-section.

DAILY GAUGE-HEIGHT AND DISCHARGE of Sixmile Coulee at Spangler's Rancho, Sask., for 1911.

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			0.68	0.2	0.76	0.4	2.12	9.3	1.45	4.1
2.....			0.70	0.2	0.70	0.2	2.10	9.1	*.....	
3.....	1.26	3.0	0.68	0.2	0.69	0.2	2.08	8.9	*	
4.....	1.20	2.6	0.70	0.2	1.20	2.6	2.09	9.0	1.51	4.5
5.....	1.10	2.0	0.72	0.3	5.00	53.0	2.07	8.8	1.43	4.0
6.....	1.05	1.8	0.79	0.5	6.45	92.0	2.03	8.5	1.34	3.4
7.....	1.04	1.7	0.83	0.6	6.50	94.0	1.90	7.4	1.29	3.1
8.....	1.03	1.6	1.15	1.1	5.75	72.0	1.86	7.1		
9.....	0.93	1.2	1.50	4.4	4.40	41.0	1.79	6.5		
10.....	0.85	0.8	1.43	1.0	4.40	41.0	1.71	5.9		
11.....	0.83	0.6	1.32	3.3	4.08	35.0	1.65	5.5		
12.....	0.78	0.4	1.20	2.6	3.45	24.0	1.61	5.2		
13.....	0.75	0.4	1.12	2.1	3.15	20.0	1.55	4.8		
14.....	0.74	0.3	1.05	1.8	3.03	19.0	1.46	4.2		
15.....	0.71	0.2	1.02	1.6	3.00	18.0	1.43	4.0		
16.....	0.71	0.2	1.00	1.5	2.39	12.0	1.39	3.7		
17.....	0.72	0.3	0.92	1.1	2.30	10.9	1.36	3.6		
18.....	0.73	0.3	0.94	1.2	2.23	10.3	1.24	2.8	.....
19.....	0.74	0.3	0.80	0.5	2.15	9.6	1.10	2.0		
20.....	0.75	0.4	0.85	0.8	2.01	8.3	1.34	3.4		
21.....	0.76	0.4	0.82	0.6	1.90	7.4	1.46	4.2		
22.....	0.76	0.4	0.75	0.4	1.94	7.7	2.07	8.8		
23.....	0.76	0.4	0.70	0.2	1.96	7.9	1.90	7.4		
24.....	0.77	0.4	0.73	0.3	2.00	8.2	1.64	5.4		
25.....	0.77	0.4	0.77	0.4	2.10	9.1	1.59	5.0		
26.....	0.78	0.4	0.80	0.5	2.18	9.8	1.53	4.6		
27.....	0.78	0.4	0.88	0.9	2.23	10.3	1.37	3.6		
28.....	0.77	0.4	0.90	1.0	2.20	10.0	1.17	2.4		
29.....	0.76	0.4	0.86	0.8	2.16	9.6	1.35	3.5		
30.....	0.74	0.3	0.82	0.6	2.14	9.5	1.39	3.7		
31.....	0.70	0.2	0.75	0.4			1.44	4.0		

* Creek frozen over.



Lindner Brothers' Rancho near Tenmile Police Detachment. Taken by M. H. French.

SESSIONAL PAPER No. 25d

MONTHLY DISCHARGE of Sixmile Coulee at Spangler's Ranche, Sask., for 1911.

Drainage area, 44 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean	Per Square Mile	Depth in Inches on Drainage Area.	Total in Acre-Feet.
July 3-31.....	3.0	0.2	0.8	0.018	0.019	44
August.....	4.4	0.2	1.2	0.027	0.031	74
September.....	94.0	0.2	21.8	0.495	0.552	1,297
October.....	9.3	2.0	5.6	0.127	0.146	344
November 1 and 4-7.....	4.5	3.1	3.8	0.086	0.016	38
The period.....					0.764	1,797

NOTE—Creek frozen over on Nov. 2 and 3.
To get total run-off of this coulee add to above the run-off at Soderstrom's ranche five miles upstream.
There is also a period June 10 to July 1 for which there are no records, which must be taken into consideration as there was a heavy precipitation throughout that period. See discharge measurements during this period on Sixmile Coulee.
There was some water diverted above this station by Spangler's irrigation ditch.

LINDNER'S DITCH NEAR BATTLE CREEK.

This station was established July 26, 1910, by H. R. Carscallen. It is located on Sec. 10, Tp. 6, Rge. 29, W. 3rd Mer., about 100 feet west of the surveyed trail to Maple Creek. It is about one quarter of a mile south of the Battle Creek post office., and about 500 yards below the intake of the ditch.
Discharge measurements are made by means of a 42-inch rectangular sharp-crested weir with complete end contractions.
The channel is straight for 200 feet above and 150 feet below the station, where it curves sharply to the right and enters Lindner Bros' hay-meadow, where it is diverted into a number of different laterals for irrigation purposes. The bed of the ditch is composed of clay and coarse gravel. The current is swift below the station.
The gauge is a plain staff graduated to feet and hundredths driven firmly into the bed of the ditch near the right bank, about twelve feet upstream from the weir. During 1911, it was read by John Lindner.
The discharge at this station must be added to that of Battle Creek at Tenmile police detachment, when computing the total run-off for the latter station.

DISCHARGE MEASUREMENTS of Lindner's Ditch near Battle Creek, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section	Mean Velocity	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Aug. 2.....	M. H. French	.....	.....	.....	2.9	0.056x
Aug. 2.....	do	.....	.....	.....	2.9	0.060x
Aug. 4.....	do	.....	.....	.....	.....	Nil. x

x Weir measurement.

2 GEORGE V., A. 1912

DAILY GAUGE-HIGHT AND DISCHARGE of Lindner's Ditch near Battle Creek, Sask., for 1911.

Day.	May.		June.		July.		August.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			3.40	2.67	3.05	0.06	2.90	0.06
2.....			3.40	2.67	3.05	0.06	2.90	0.06
3.....			3.40	2.67	3.05	0.06	2.90	0.06
4.....			3.40	2.67	3.05	0.06	2.90	0.06
5.....			3.40	2.67	3.05	0.06	2.90	0.06
6.....			3.40	2.67	2.90	0.06	2.90	0.06
7.....			3.40	2.67	2.90	0.06	2.90	0.06
8.....			3.40	2.67	2.90	0.06	2.90	0.06
9.....	3.35	2.17	3.40	2.67	2.90	0.06	2.88	0.06
10.....	3.35	2.17	3.40	2.67	2.90	0.06	2.89	0.04
11.....	3.35	2.17	3.40	2.67	2.90	0.06	2.89	0.04
12.....	3.35	2.17	3.05	0.06	2.90	0.06	2.89	0.04
13.....	3.35	2.17	3.05	0.06	2.90	0.06	2.89	0.04
14.....	3.35	2.17	3.05	0.06	2.90	0.06	2.89	0.04
15.....	3.45	3.21	3.05	0.06	3.10	1.27	2.89	0.04
16.....	3.45	3.21	3.05	0.06	3.10	1.27	2.89	0.04
17.....	3.45	3.21	3.05	0.06	3.10	1.27	2.89	0.04
18.....	3.05	0.06	3.05	0.06	3.10	1.27	2.89	0.04
19.....			3.05	0.06	3.10	1.27	2.89	0.04
20.....			3.05	0.06	3.10	1.27	2.89	0.04
21.....			3.05	0.06	3.10	1.27		†
22.....			3.05	0.06	2.90	0.06		
23.....			3.05	0.06	2.90	0.06		
24.....			3.05	0.06	2.90	0.06		
25.....			3.05	0.06	2.90	0.06		
26.....			3.05	0.06	2.90	0.06		
27.....			3.05	0.06	2.90	0.06		
28.....			3.05	0.06	2.90	0.06		
29.....		....	3.05	0.06	2.90	0.06	...	
30.....		....	3.05	0.06	2.90	0.06		
31.....		....			2.90	0.06		

NOTE—This is a 42" Weir Station. Elevation of crest May 9 to July 6, is 3.02 above zero of gauge; July 6 to Aug. 20 2.87' above zero of gauge.
†Headgate closed May 19 to June 1st.
‡Closed for the season.

MONTHLY DISCHARGE of Lindner's Ditch near Battle Creek, Sask., for 1911.

MONTH.	DISCHARGE IN SECOND-FEET			Total Discharge in acre feet.
	Maximum.	Minimum	Mean.	
May (9-18). ..	3.21	0.06	2.27	15
June.....	2.67	0.06	1.02	60
July.....	1.27	0.06	0.33	20
August (1-20).	0.06	0.04	0.05	2
The period....				127

TENMILE CREEK AT TENMILE POLICE DETACHMENT.

This station was established July 21, 1909, by H. R. Carscallen. It is located about 300 yards west of the Tenmile police detachment near the mouth of the stream. The station is very close to the south boundary of Sec. 4, Tp. 6, Rge. 29, W. 3rd Mer., almost on the quartering line of the section, and about two miles south of Battle Creek post office.

The channel is straight for fifteen feet above and twenty feet below the stream. Both banks are high, free from brush and not liable to overflow. The bed of the stream is composed of sand and coarse gravel. There is a small rapid above the station, but the current at the station is rather sluggish.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to and upright post sunk in the bed of the stream at the right bank and securely stayed to the bank. The gauge



Wood and Anderson's Rancho.

SESSIONAL PAPER No. 25d

is referred to bench marks as follows: (1) the top of the initial-point stake driven close to the ground on the left bank and marked "B.M." in red paint (elevation, 5.84 feet above the zero of the gauge); (2) the head of a spike driven into the pointed top of a willow stump about 100 feet downstream from the station on the right bank, the stump blazed and marked "B.M." in red paint (elevation, 6.15 feet above the zero of the gauge.)

Discharge measurements are made at or near the gauge by wading, and at very low stages a weir is used. The initial point for soundings is a square stake, close to the ground on the left bank and marked "I.P." with red paint.

During 1911, the gauge was read by W. G. Patterson.

DISCHARGE MEASUREMENTS of Tenmile Creek at Tenmile Police Detachment, Sask., in 1911.

Date	Hydrographer	Width	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 22.....	M. H. French.....	5.20	2.94	0.151	1.94	0.260
May 18.....	do.....	5.50	2.50	0.108	0.62	0.244
June 10.....	do.....	5.80	3.24	0.091	0.59	0.270
July 1.....	do.....	5.06	3.52	0.067	0.63	0.296
Sept. 2.....	do.....	5.50	3.50	0.121	0.69	0.224
Sept. 15.....	do.....	5.80	4.79	0.053	0.76	0.423*
Sept. 30.....	do.....				0.98	0.400*

* Beaver dams raising water

DAILY GAUGE-HEIGHT AND DISCHARGE of Tenmile Creek, at Tenmile Police Detachment, Sask., for 1911.

Day.	May.		June.		July.		August.		September.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			0.63	0.4	0.62	0.3	0.59	0.1	0.70	0.3
2.....			0.62	0.4	0.63	0.4	0.59	0.1	0.69	0.3
3.....			0.62	0.4	0.63	0.3	0.59	0.1	0.69	0.3
4.....			0.63	0.4	0.62	0.3	0.59	0.1	0.69	1.6
5.....			0.64	0.5	0.64	0.4	0.60	0.1	1.00	2.6
6.....			0.64	0.5	0.63	0.3	0.85	1.4	2.00	26.0
7.....			0.65	0.5	0.62	0.2	0.65	0.2	1.73	19.0
8.....			0.63	0.4	0.62	0.2	0.67	0.3	1.67	17.0
9.....			0.63	0.4	0.62	0.2	0.67	0.2	1.50	12.0
10.....			0.59	0.2	0.63	0.3	0.61	0.1	1.20	5.4
11.....			0.58	0.2	0.63	0.3	0.61	0.1	1.00	2.5
12.....			0.59	0.2	0.62	0.2	0.60	0.1	0.90	1.4
13.....			0.59	0.2	0.64	0.3	0.59	0.1	0.86	1.1
14.....			0.60	0.2	0.64	0.3	0.59	0.1	0.89	0.7
15.....			0.59	0.2	0.63	0.2	0.58	Nil.	0.75	0.4
16.....			0.58	0.2	0.64	0.2	0.58		0.70	0.1
17.....			0.58	0.2	0.62	0.2	0.58		0.70	0.1
18.....	0.65	0.6	0.57	0.1	0.61	0.1	0.58		0.70	0.1
19.....	0.62	0.4	0.58	0.2	0.61	0.1	0.58		0.69	Nil.
20.....	0.63	0.4	0.59	0.2	0.60	0.1	0.58		0.67	
21.....	0.61	0.3	0.59	0.2	0.60	0.1	0.59		0.67	
22.....	0.60	0.3	0.61	0.3	0.61	0.1	0.58		0.7	0.1
23.....	0.72	1.9	0.59	0.2	0.61	0.1	0.65	0.2	0.95	0.9
24.....	0.65	0.6	0.60	0.2	0.61	0.1	0.65	0.2	1.00	1.1
25.....	0.63	0.4	0.60	0.2	0.60	0.1	0.63	0.1	1.03	1.3
26.....										
27.....	0.65	0.6	0.61	0.3	0.59	0.1	0.65	0.1	1.03	1.2
28.....	0.68	0.7	0.60	0.2	0.59	0.1	0.65	0.2	1.00	0.8
29.....	0.63	0.4	0.60	0.2	0.59	0.1	0.66	0.2	1.00	0.7
30.....	0.62	0.4	0.59	0.1	0.59	0.1	0.67	0.2	0.95	0.4
31.....	0.63	0.4	0.60	0.2	0.59	0.1	0.70	0.3	0.98	0.4
32.....	0.64	0.5			0.59	0.1	0.70	0.3		

NOTE—Applied changing conditions from June 10 to September 30 because of beaver dams below. Gauge heights after Sept. 30 valueless but the approximate monthly discharge is 0.3 sec.-ft. or 18 acre-feet. This creek would be dry all summer but for springs just above the station.

MONTHLY DISCHARGE of Tenmile Creek at Tenmile Police Detachment, Sask., for 1911.

Drainage area, 24 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-feet
May 18-31.....	1.0	0.3	0.58	0.021	0.011	14
June.....	0.5	0.1	0.27	0.011	0.012	16
July.....	0.4	0.1	0.19	0.008	0.009	12
August.....	1.4	0.0	0.16	0.007	0.008	10
September.....	26.0	0.0	3.26	0.136	0.152	194
The period.....					0.192	246

NOTE—Run-off during October was approximately 0.3 sec.-ft., or 18 acre-feet.

BATTLE CREEK AT TENMILE POLICE DETACHMENT.

This station was established June 3, 1909, by F. T. Fletcher. It is located below the mouth of Tenmile Creek at the highway bridge on the surveyed trail from Maple Creek to Tenmile, and about 400 yards from the Tenmile police detachment. It is practically in the centre of N.E. 14 Sec. 33, Tp. 5, Rge. 29, W. 3rd Mer., about two miles south of Battle Creek post office and 55 miles south of Maple Creek. The bridge is a steel structure of the pony-truss type, consisting of one eighty foot span, supported by two timber, rock-filled piers and having a twenty-foot approach at each end of the bridge. There is only one channel at all ordinary stages of the stream, but owing to the presence of the two piers supporting the truss there are three channels at times of floods.

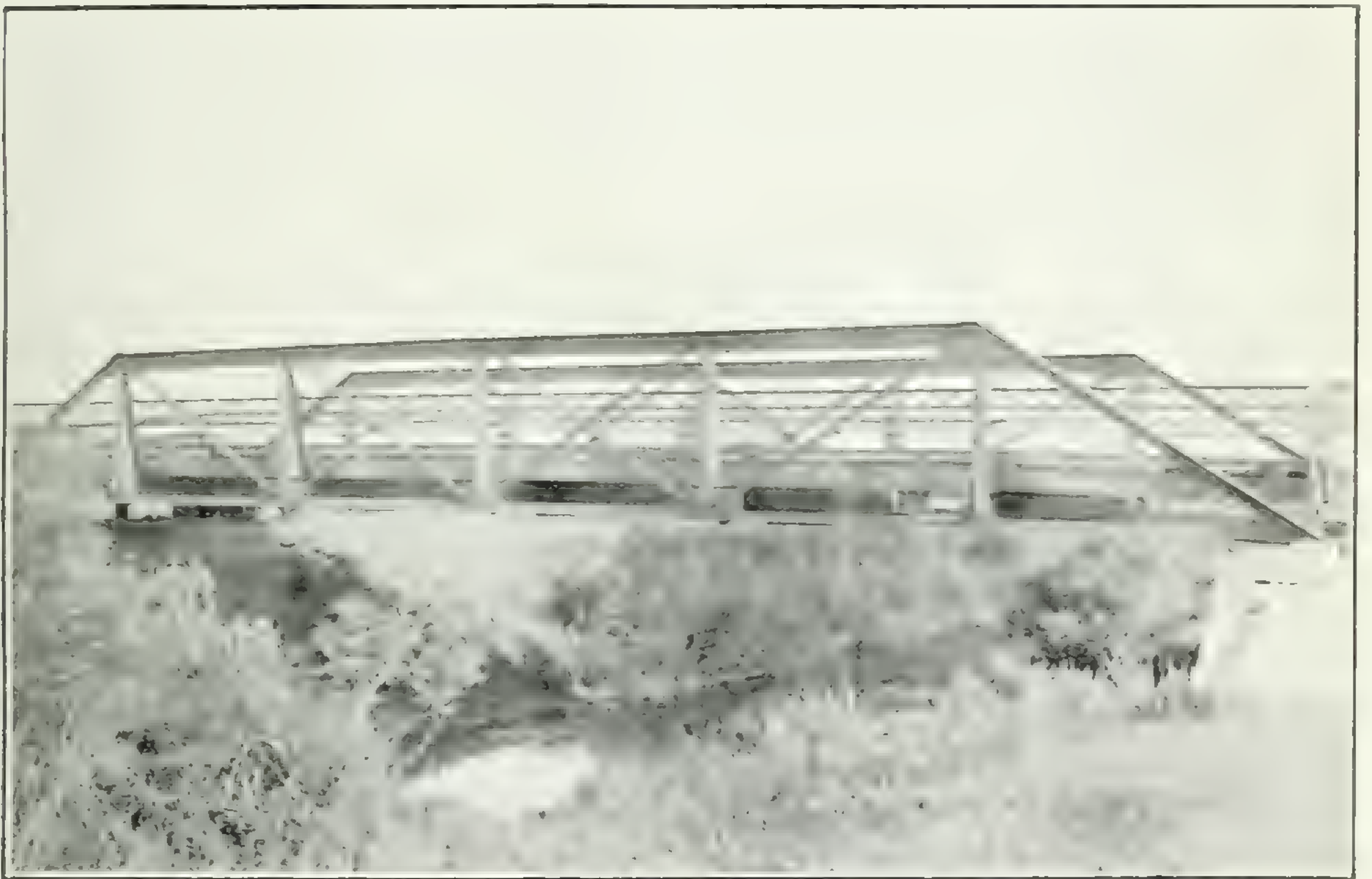
The channel is straight for 500 feet above and 300 feet below the station. Both banks are high and not liable to overflow except in extreme floods, when the water breaks over the right bank some distance above the station and flows around the bridge. The right bank is free of brush for some distance above and below the station; the left bank is sparsely covered with willows near the station. The bed of the stream is sandy, and may shift somewhat in high stages of the stream. The current is very sluggish, and at very low stages vegetation appears in the bed of the stream at the station. During the summer months there is a heavy growth of weeds in the bottom of the channel which retards the water and alters conditions at the regular cross-section. Daily discharges for 1911 were obtained, therefore, by an indirect method, similar to that used for shifting channels. As there were several measurements obtained during the summer, the results may be considered fairly accurate.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the inner face of the right abutment. Low-water measurements are made by wading near the bridge.

The gauge, which is of the standard chain type, is located about the centre of the steel truss and is securely fastened to the guard-rail on the downstream side of the bridge. The length of the chain from the bottom of the weight to the marker is 19.10 feet. The zero of the gauge (elev., 86.87) is referred to a permanent iron bench-mark (assumed elev., 100.00) at the northeast corner of the bridge. The bench-mark stands about three inches above ground and is well protected by rock. It is nine feet southwest of road diversion pin "R.V." and thirty feet north-east of the north end of the bridge pier.

During 1911, the gauge was read by Const. C. H. Green, of the R. N. W. M. Police.

PLATE NO. 26.



Bridge over Battle Creek at Tenmile Police Detachment.

SESSIONAL PAPER No. 25d

DISCHARGE MEASUREMENTS of Battle Creek at Tenmile Police Detachment, Sask., in 1911.

Date.	Hydrographer	Width.	Area of Section	Mean Velocity.	Gauge Height	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 21	M. H. French	37 5	106 80	1 372	4 650	146 50
May 18.	do	33 3	64 11	0 875	3 290	55 81†
June 10	do	30 0	52 70	0 513	3 020	27 08‡
July 5.	do		65 30	0 491	3 180	32 02
July 13	do		60 58	0 265	3 215	16 07
July 19.	do		55 30	0 152	3 060	8 43
Aug. 1.	do	32 0	53 70	0 144	3 100	7 73
Aug. 10	do	36 0	73 71	0 403	3 645	29 71^
Aug. 24.	do		53 02	0 149	3 000	7 94†
Sept. 2.	do		50 25	0 139	2 890	7 02
Sept. 7.	do	43 0	191 12	1 628	6 690	311 22
Sept. 15.	do	33 0	69 50	0 754	3 610	72 39‡
Sept 25.	do	32 0	63 60	0 706	3 430	44 80‡
Oct. 26.	do	32 0	58 70	0 721	3 270	42 19*
Oct 26.	do	32 0	62 66	0 775	3 400	48 56*

* Rapidly changing gauge height.
† Gauged 1,000 feet down stream from the bridge.
‡ Gauged 500 feet down stream from the bridge.
^ Gauged 600 feet down stream from the bridge.

DAILY GAUGE-HEIGHT AND DISCHARGE of Battle Creek at Tenmile Police Detachment, Sask., for 1911.

Day.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			3 48	56 0	3 03	32 0	3 00	57 0
2.....			3 57	60 0	2 97	29 0	3 81	51 0
3.....			3 61	64 0	2 83	23 0	3 76	48 0
4.....			3 72	70 0	2 84	22 0	3 58	39 0
5.....			3 80	76 0	2 90	21 0	3 48	32 0
6.....			3 75	74 0	2 64	26 0	3 49	33 0
7.....			3 55	61 0	2 91	23 0	3 34	25 0
8.....			3 40	53 0	3 03	28 0	3 31	23 0
9.....			3 21	43 0	2 66	25 0	3 57	25 0
10.....			3 16	41 0	3 01	27 0	3 34	23 0
11.....			3 17	42 0	2 92	23 0	3 31	22 0
12.....			3 16	41 0	2 86	20 0	3 29	20 0
13.....			3 08	38 0	2 83	18 0	3 20	16 0
14.....			3 01	34 0	2 83	18 0	3 17	14 0
15.....			3 06	37 0	2 76	15 0	3 16	13 0
16.....			3 27	48 0	2 67	11 0	3 01	8 5
17.....			3 57	67 0	2 54	7 5	3 00	8 0
18.....			3 40	56 0	2 57	8 0	3 05	9 0
19.....			3 21	45 0	2 60	8 0	3 04	9 5
20.....			3 26	48 0	2 60	8 0	3 05	8 4
21.....	4 05	146	3 20	45 0	2 61	8 0	3 14	11 0
22.....	4 59	122	3 11	39 0	2 70	9 5	3 19	12 5
23.....	4 10	98	3 32	49 0	2 76	11 0	3 17	11 5
24.....	3 96	87	3 42	55 0	2 78	12 0	3 30	15 0
25.....	3 82	77	3 33	49 0	3 20	26 0	3 25	13 0
26.....	3 80	76	3 40	53 0	4 35	93 0	3 20	11 0
27.....	3 86	80	3 46	56 0	4 00	69 0	3 12	8 0
28.....	3 63	64	3 44	54 0	3 53	39 0	3 08	7 5
29.....	3 45	54	3 30	47 0	3 51	37 0	3 01	5 0
30.....	3 30	45	3 22	41 0	3 55	39 0	3 03	5 5
31.....			3 13	36 0			3 17	9 0

DAILY GAUGE-HEIGHT AND DISCHARGE of Battle Creek at Tenmile Police Detachment, Sask., for 1911.—Continued.

Day.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3 14	9 0	2 93	7 0	3 22	36 0	3 06	32 0
2.....	3 12	8 5	2 86	6 0	3 22	36 0	3 08	33 0
3.....	3 12	9 0	2 85	6 0	3 25	38 0	3 10	34 0
4.....	3 14	10 0	3 35	25 0	3 62	56 0	3 04	31 0
5.....	3 16	11 0	6 06	245 0	3 45	49 0	3 12	35 0
6.....	3 94	*43 0	7 60	415 0	3 39	45 0	3 04	31 0
7.....	3 55	25 0	6 74	321 0	3 27	39 5	3 15	36 0
8.....	3 70	32 0	6 13	255 0	3 22	38 0		
9.....	3 75	34 0	5 40	181 0	3 20	37 0		
10.....	3 63	29 0	4 87	133 0	3 18	36 0		
11.....	3 50	23 0	4 27	87 0	3 13	34 0		
12.....	3 39	20 0	4 03	73 0	3 10	33 0		
13.....	3 31	17 5	3 90	67 0	3 06	31 0		
14.....	3 30	17 5	3 71	58 0	3 04	30 0		
15.....	3 20	14 0	3 60	52 0	3 02	29 0		
16.....	3 10	11 0	3 49	46 0	3 00	28 0		
17.....	3 10	11 0	3 46	45 0	2 90	24 0		
18.....	3 07	10 0	3 44	44 0	3 06	32 0		
19.....	2 98	8 0	3 40	42 0	3 12	34 0		
20.....	2 96	7 0	3 30	38 0	3 10	33 0		
21.....	2 92	6 0	3 18	32 0	3 09	33 0		
22.....	2 93	6 4	3 60	54 0	3 10	33 0		
23.....	3 00	8 0	3 40	43 0	3 33	44 0		
24.....	3 02	8 5	3 40	43 0	3 25	41 0		
25.....	2 99	7 5	3 44	45 0	3 17	37 0		
26.....	2 99	7 5	3 43	45 0	3 10	34 0		
27.....	3 02	9 0	3 42	45 0	3 13	36 0		
28.....	3 00	8 0	3 38	42 0	3 27	42 0		
29.....	3 00	8 5	3 30	39 0	3 55	57 0		
30.....	2 96	7 5	3 27	38 0	3 10	34 0		
31.....	2 98	8 0			3 04	31 0		

*Increase in discharge due to rain in hills.
NOTE—Applied shifting conditions throughout the summer due to growth of grass in the channel. There was a considerable daily flow at this point during the latter part of March and the early part of April.

MONTHLY DISCHARGE of Battle Creek at Tenmile Police Detachment, Sask., for 1911.

Drainage area, 201 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet.
April 21-30.....	146	45	84.9	0.422	0.157	1,684
May.....	76	34	50.9	0.253	0.292	3,130
June.....	93	8	24.6	0.122	0.136	1,464
July.....	57	5	19.1	0.095	0.110	1,174
August.....	43	6	14.0	0.070	0.080	861
September.....	415	6	85.7	0.426	0.475	5,100
October.....	56	28	36.8	0.183	0.211	2,263
November 1-7.....	36	31	33.1	0.165	0.041	460
The period.....					1.502	16,136

NOTE—There was some water diverted by Lindner's ditch during 1911. See records for Lindner's ditch elsewhere.

SESSIONAL PAPER No. 25d

MARSHALL'S DITCH NEAR TENMILE POLICE DETACHMENT.

This station was established on July 11, 1911, by W. A. Fletcher. It is located in the N.E. 1/4 Sec. 33, Tp. 5, Rge. 29, W. 3rd Mer., about half a mile below the regular station upon Battle Creek near the Tenmile police detachment.

The channel is straight for 100 feet above and 40 feet below the station. The bottom of the channel is muddy, and covered with a rank growth of weeds which will alter conditions at the station.

The gauge, which is a plain staff graduated to feet and inches, is nailed to a post sunk in the ditch near the right bank. The zero is referred to a bench-mark upon a three-inch stake upon the right bank above the gauge.

Measurements are made either with a current-meter or a weir.

This station was established too late to secure records of the amount of water diverted in the season of 1911.

DISCHARGE MEASUREMENTS of Marshall's Ditch near Tenmile Police Detachment, Sask., in 1911.

Date	Hydrographer.	Width.	Area of Section	Mean Velocity	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Inches</i>	<i>Sec.-ft.</i>
Aug. 2.....	M. H. French	0.6	2.92	0.106	...	0.309
Aug. 25.....	do	...	...	...	...	Nil
Sept 20.....	do	7.5	4.75	0.465	4 1/4	2.210

GAFF'S DITCH NEAR TENMILE POLICE DETACHMENT.

This station was established on July 11, 1911, by W. A. Fletcher. It is located in the S.W. 1/4 Sec. 25, Tp. 5, Rge. 29, W. 3rd. Mer.

The channel is straight for 200 feet above and 300 feet below the station. The bottom of the ditch is composed of a sandy loam.

The gauge, which is a plain staff divided into feet and inches, is nailed to a post near the right bank. The zero (elev. 97.29) is referred to a bench-mark (assumed elev., 100.00) situated three feet southwest of the gauge.

This station was established too late to secure records of the amount of water appropriated in 1911.

DISCHARGE MEASUREMENTS of Gaff's Ditch near Tenmile Police Detachment, Sask., in 1911.

Date.	Hydrographer.	Width	Area of Section	Mean Velocity	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Inches</i>	<i>Sec.-ft</i>
May 19.....	M. H. French.....	8.0	8.36	1.580	...	13.21
Aug. 2.....	do	...	...	...	...	Nil.
Aug. 25.....	do	...	...	...	...	Nil.
Sept. 25.....	do	5.5	2.47	0.647	5.25	1.60x

x Melting snow only.

BATTLE CREEK AT WILSON'S RANCHE.

This station was established July 5, 1910, by H. R. Carscallen. It is located in the S.W. 1/4 Sec. 2, Tp. 6, Rge. 28, W. 3rd Mer., about three quarters of a mile south of Wilson's house and below his irrigation ditch. It is about ten miles east of Battle Creek post office.

The channel is straight for about 200 feet above and 125 feet below the station. Both banks are high, sparsely covered with brush and not liable to overflow. The bed is composed of sand and gravel, and is liable to shift.

Discharge measurements are made at the station by wading. The initial point for soundings is a squared stake, driven within one foot of the ground in the left bank, 73 feet from the gauge-height and marked "I.P. OO."

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to a post sunk in the bed of the stream on the left bank. It is referred to a bench-mark upon a spike-head in a hub driven close to the final point stake on the right bank; elevation 12.58 feet above the zero of the gauge.

During 1911, the gauge was read by W. S. Wilson.
This station is important, as it is the nearest point upon Battle Creek to Cypress Lake at which an observer can be obtained. The storage possibilities of Cypress Lake are under investigation.

DISCHARGE MEASUREMENTS of Battle Creek at Wilson's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 17.....	M H French	37.0	40.39	1.876	3.855	75.79†
May 10.....	do	36.4	42.04	1.039	1.850	43.70
June 3.....	do	35.6	25.81	0.712	1.420	18.39
July 12.....	do	36.0	26.52	0.543	1.450	11.41
Aug. 4.....	do	36.0	24.94	0.158	1.370	11.43
Aug. 26.....	do	35.0	24.31	0.468	1.350	11.40
Sept. 23.....	do	37.5	58.30	0.773	1.890	45.09
Oct. 26.....	do	37.0	56.01	0.788	1.910	44.19*

* Poor conditions
† Ice in channel.

DAILY GAUGE-HEIGHT AND DISCHARGE of Battle Creek at Wilson's Ranche, Sask., 1911.

Day.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			4.80	†	2.05	57	1.60	28.0
2.....			5.00	†	2.20	69	1.55	25.0
3.....			5.00	†	2.26	74	1.40	17.0
4.....			5.00	†	2.27	75	1.30	13.0
5.....			5.00	†	2.50	94	1.60	29.0
6.....			5.00	†	2.50	94	1.60	28.0
7.....			4.90	†	2.40	85	1.55	25.0
8.....			4.55	†	2.10	61	1.65	31.0
9.....			4.30	†	2.08	59	1.62	29.0
10.....			4.32	†	1.82	41	1.58	26.0
11.....			4.50	†	1.79	39	1.55	25.0
12.....			4.47	†	1.80	40	1.44	18.0
13.....			4.57	†	1.80	40	1.35	15.0
14.....			4.30	†	1.66	31	1.17	7.0
15.....			4.15	†	1.60	27	1.10	5.0
16.....			4.00	†	1.60	27	1.08	4.0
17.....			3.85	76.0*	1.85	44	1.05	3.5
18.....			4.66	178.0*	2.00	55	1.05	3.5
19.....			4.65	208.0*	1.82	42	1.04	3.3
20.....			3.70	146.0*	1.80	41	1.04	3.3
21.....			3.30	140.0*	1.95	51	1.03	3.0
22.....			3.20	158.0*	1.90	48	1.04	3.2
23.....			2.87	126.0	1.84	44	1.05	3.3
24.....			2.65	106.0	1.86	46	1.33	12.0
25.....	5.70	†	2.30	77.0	1.85	45	1.85	12.0
26.....	5.68	†	2.39	84.0	1.86	46	2.60	103.0
27.....	5.68	†	2.25	73.0	1.87	47	2.20	69.0
28.....	5.69	†	2.30	77.0	1.88	48	1.88	43.0
29.....	5.60	†	2.10	61.0	1.85	45	1.70	31.0
30.....	5.40	†	2.05	57.0	1.84	44	1.72	32.0
31.....	4.70	†			1.70	35		

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Battle Creek at Wilson's Ranche, Sask., for 1911.
Continued,

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2.04	54.0	1.33	10.0	1.26	9.4	1.85	42	2.00	53
2	2.00	52.0	1.32	9.5	1.25	9.0	1.82	40	1.91	47
3	2.00	52.0	1.33	10.0	1.24	8.7	1.80	39	1.89	39
4	1.86	41.0	1.34	10.5	2.00	53.0	2.00	53	1.74	35
5	1.80	37.0	1.35	11.0	3.80	241.0	2.01	54	1.70	32
6	1.70	30.0	1.36	11.0	5.30	490.0	1.94	49	1.85	42
7	1.61	24.0	1.70	28.0	5.00	440.0	1.89	39	2.00	53
8	1.58	22.0	1.84	38.0	4.72	388.0	1.86	43		
9	1.54	19.0	1.80	35.0	3.80	211.0	1.85	42		
10	1.50	17.0	1.84	38.0	3.35	182.0	1.84	42		
11	1.48	16.0	1.70	28.0	2.70	112.0	1.81	40		
12	1.45	14.0	1.60	23.0	2.40	85.0	1.89	39		
13	1.39	12.0	1.53	19.0	2.41	86.0	1.79	38		
14	1.35	10.0	1.50	18.0	2.30	77.0	1.78	38		
15	1.30	8.6	1.47	16.0	2.21	70.0	1.77	37		
16	1.30	8.6	1.44	15.0	2.00	53.0	1.77	37		
17	1.30	8.6	1.39	13.0	1.90	46.0	1.74	35		
18	1.30	8.6	1.37	12.0	1.92	47.0	1.75	36		
19	1.30	8.6	1.35	12.0	1.95	50.0	1.78	38		
20	1.30	8.6	1.31	11.0	2.00	53.0	1.79	38		
21	1.30	8.6	1.28	9.0	1.96	50.0	1.82	40		
22	1.30	8.6	1.25	8.5	1.93	48.0	1.80	39		
23	1.35	11.0	1.24	8.0	1.91	47.0	1.90	46		
24	1.43	14.0	1.25	8.5	1.94	49.0	1.95	50		
25	1.45	15.0	1.28	9.5	1.82	40.0	1.93	48		
26	1.50	17.0	1.33	12.0	1.81	40.0	1.90	46		
27	1.40	13.0	1.32	11.6	1.82	40.0	1.88	45		
28	1.35	11.0	1.30	10.7	1.82	40.0	2.07	59		
29	1.30	8.8	1.28	10.0	1.86	43.0	2.00	53		
30	1.30	8.8	1.27	9.7	1.85	42.0	1.94	49		
31	1.31	9.0	1.27	9.7			1.98	52		

‡ Ice conditions for which no data is available.
* Applied shifting conditions because of ice in bottom of channel.
NOTE—Applied shifting conditions because of grass in bottom of channel from May 10 to Aug. 26.

MONTHLY DISCHARGE of Battle Creek at Wilson's Ranche, Sask., for 1911.

Drainage area, 260 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.		
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet.
April 17-30	208	57.0	111.9	0.430	0.224	3,107
May	94	27.0	51.4	0.198	0.228	3,160
June	103	3.0	22.7	0.087	0.097	1,351
July	54	8.6	18.6	0.072	0.083	1,144
August	38	8.0	15.3	0.059	0.068	941
September	490	8.7	106.0	0.408	0.455	6,307
October	59	35.0	43.4	0.167	0.192	2,669
November 1-7	53	33.0	43.0	0.165	0.043	597
The period					1.390	19,276

NOTE—There was considerable run-off in April, March and November that is not included in above data. The water diverted by Marshall & Gaff's irrigation ditch during the months of April, May and June must be included in above when comparing it with the corresponding data for Battle creek at Tenmile Police Detachment.

GILCHRIST BROTHERS' DITCH NEAR KELVINHURST.

This station was established on October 16, 1911, by F. T. Fletcher. It is located on the S.W. ¼ Sec. 11, Tp. 5, Rge. 29, W. 3rd Mer., at the intake to the ditch.

The gauge, which is a plain staff graduated to feet and inches, is nailed to the right side of a flume at a point 45 feet from the intake gate. The zero of the gauge (elev., 96.92) is referred to the top of a post at the lower end of the flume (assumed elev., 100.00).

Discharge measurements may be made with a meter in the flume or with a weir below the flume.

No water was diverted after the gauge had been installed.

RICHARDSON'S DITCH NEAR KELVINHURST.

This station was established on October 14, 1911, by F. T. Fletcher. It is located on the S.E. ¼ Sec. 2, Tp. 5, Rge. 27, W. 3rd Mer., 192 feet east and twelve feet north of the southwest corner of the quarter section.

The gauge, which is a plain staff graduated to feet and inches, is nailed to a post at the right bank of the ditch. The top of the gauge (elev., 99.70) is referred to the top of the pin in the "mound" on the north boundary of Sec. 35, Tp. 4, Rge. 27, W. 3rd Mer.

The ditch is straight for 200 feet above and 500 feet below the gauge. The cross-section is uniform, and the banks are in good condition.

Discharge measurements may be made with a weir or a meter by wading near the gauge.

No water was diverted after the gauge had been installed.

DISCHARGE MEASUREMENTS of Richardson's Ditch near Kelvinhurst, Sask., in 1911.

Date.		Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 3	.....	M. H. French	.....	.....	.....	.....	1.347
July 11	.....	do	.....	.....	.....	.....	0.545x
Aug 4	.....	do	.....	.....	.....	.....	0.300x

x Weir measurement.

McKINNON'S DITCH NEAR KELVINHURST.

This station was established on October 20, 1911, by F. T. Fletcher. It is located on the N.W. ¼ Sec. 20, Tp. 4, Rge. 26, W. 3rd Mer., about 364 feet south and 127 feet east of the north-west corner of Sec. 20 and near James McKinnon's house.

The gauge, which is a plain staff graduated to feet and inches, is nailed to a post near the left bank of the ditch. The top of the gauge (elev., 100.59) is referred to the top of a stake on the left bank, and thirteen feet downstream from the gauge.

The ditch is straight for 75 feet above and 1500 feet below the gauge. The bed and banks of the ditch are composed of clay. The cross-section is uniform, and the banks in good condition at the gauge. The fall is one and a half feet per mile.

Discharge measurements may be made with either a meter or a weir, according to the quantity of water in the ditch.

No water was diverted after the gauge had been installed.

DISCHARGE MEASUREMENTS of McKinnon's Ditch near Kelvinhurst, Sask., in 1911.

Date.		Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Aug. 28	.....	M. H. French	9.0	6.45	0.813	.....	5.35

STIRLING AND NASH'S DITCH NEAR KELVINHURST.

This station was established on July 11, 1911, by M. H. French. It is located on Sec. 22, Tp. 3, Rge. 7, W. 3rd Mer., and is about one mile from the head-gate of the ditch and 1,000 feet east of Stirling Brothers' house.



Gauging Station on Battle Creek at Nash's Rancho. Taken by M. H. French.

SESSIONAL PAPER No. 25d

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post and braced to a small bridge near the centre of the ditch. The zero of the gauge (elev., 94.81) is referred to the top of a stake on the right bank (assumed elev., 100.00).

The ditch is straight for 1,000 feet above and 600 feet below the gauge. The cross-section is uniform, and the bed and banks of the ditch are in good condition at this point.

Discharge measurements are made with a current-meter by wading near the gauge at ordinary stages but during low water a weir is used.

DISCHARGE MEASUREMENTS of Stirling and Nash's Ditch near Kelvinhurst, Sask., in 1911

Date	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 11	M. H. French.....		6.82	0.904		6.17
June 5	do	9.0	6.40	1.200		7.67
July 10.....	do	8.3	8.27	1.240	1.35	10.24
Aug. 5.....	do				0.50	Nil.

MEAN DAILY GAUGE-HEIGHT, in feet, of Stirling and Nash's Ditch, near Kelvinhurst, Sask., for 1911.

Day.	July	August.
1		0.56
2		0.55
3		0.52
4		0.50
5		0.50
6		0.53
7		0.55
8		0.55
9		0.50
10		0.42
11.	1.20	0.54
12.	1.20	0.26
13.	1.30	0.18
14.	1.27	0.14
15.	1.25	0.09
16.	1.25	0.06
17.	1.22	0.02
18.	1.14	
19.	1.14	
20.	1.14	
21.	1.14	
22.	1.14	
23.	1.12	
24.	1.10	
25.	0.80	
26.	0.72	
27.	0.70	
28.	0.66	
29.	0.64	
30.	0.62	
31.	0.58	

BATTLE CREEK AT NASH'S RANCHE.

This station was established May 11, 1910, by N. M. Sutherland. It is located on the N.E. ¼ Sec. 3, Tp. 3, Rge. 27, W. 3rd Mer., and is 270 feet west of E. R. Nash's house. It is about seventy miles by trail from Maple Creek.

The stream flows in one channel 45 feet wide at ordinary stages. The channel is straight for about 250 feet above and 300 feet below the station. The right bank is solid clay, high and not liable to overflow. The left bank is also of clay, but is low, and liable to overflow during high stages of the stream. The bed of the stream is composed of sand and gravel and may shift in high stages of the stream.

Discharge measurements are made at low and ordinary stages, by wading, but during high water the stream cannot be waded and the discharge is computed by slope measurements. The initial point for soundings is the face of a post on the left bank, marked "O O O" in red paint.

The gauge, which is a plain staff graduated to feet and hundredths, is fastened to a post sunk in the bed of the stream at the left bank. The zero elev., 90.23 is referred to a permanent iron bench-mark assumed elev., 100.00 on the left bank, seven feet east of the initial point of soundings, and in the line of the cross-section. The bench-mark is also 1902.6 feet S. 81° 28' W from the northeast corner of Sec. 3, Tp. 3, Rge. 27, W. 3rd Mer. It is about eight inches above ground and is protected by a mound of rock.

During 1911, the gauge was read by E. R. Nash.
With the exception of Badger's irrigation ditch, this station is below all the irrigation ditches on Battle Creek. During 1911, Stirling and Nash's ditch diverted a small quantity of water during May, June and July, and Richardson's ditch was running an average of one cubic foot per second all summer.

DISCHARGE MEASUREMENTS OF BATTLE CREEK at Nash's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 18	M. H. French	44.3	65.00	1.390	1.910	90.22†
May 12	do	44.0	34.90	1.071	1.250	37.41
June 5	do	40.0	15.20	0.700	0.730	10.61‡
July 10	do	40.0	16.10	0.927	0.720	10.10
Aug. 6	do	40.0	16.16	0.564	0.710	9.12
Aug. 28	do	32.0	6.92	0.319	0.470	2.21▲
Sept. 13	do	77.0	30.50	2.330	6.150	711.60*
Sept. 19	do	43.5	41.79	1.124	1.375	46.93
Oct. 21	do	43.5	36.30	0.921	1.180	33.45

† Gauged 300 ft. down stream.
‡ Gauged 1,000 ft. up stream.
▲ Gauged 500 ft. up stream.
* Slope measurement.

DAILY GAUGE-HEIGHT AND DISCHARGE of Battle Creek at Nash's Ranche, Sask., for 1911.

Day.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.95	94	1.65	68	1.17	33.0	1.25	38.0
2.....	2.45	140	1.55	60	1.05	26.0	0.87	16.0
3.....	1.98	96	1.54	59	0.90	18.0	0.93	20.0
4.....	1.95	94	1.65	68	0.85	15.0	1.04	25.0
5.....	1.85	84	1.75	76	0.80	13.0	1.05	26.0
6.....	1.90	89	1.85	84	0.68	8.3	1.03	25.0
7.....	1.75	76	1.90	89	0.65	7.3	0.94	20.0
8.....	2.74	169	1.75	76	0.75	11.0	0.90	18.0
9.....	1.56	61	1.68	70	0.80	13.0	0.80	13.0
10.....	1.70	72	1.42	50	0.75	11.0	0.74	11.0
11.....	1.65	68	1.30	42	0.83	14.5	0.65	7.3
12.....	1.65	68	1.25	38	0.80	13.0	0.60	5.5
13.....	1.92	91	1.20	35	0.80	13.0	0.55	4.2
14.....	2.47	142	1.10	29	0.70	9.0	0.55	4.2
15.....	2.80	175	1.05	26	0.65	7.3	0.53	3.8
16.....	1.80	80	1.06	27	0.54	4.0	0.46	2.4
17.....	1.85	84	1.05	26	0.44	2.0	0.45	2.2
18.....	1.85	84	1.05	26	0.38	1.2	0.45	2.2
19.....	2.79	174	1.18	34	0.40	1.4	0.54	4.0
20.....	2.85	180	1.30	42	0.44	2.0	0.44	2.0
21.....	2.45	140	1.10	29	0.48	2.7	0.45	2.2
22.....	2.65	160	1.10	29	0.52	3.5	0.34	0.7
23.....	2.25	120	1.30	42	0.50	3.0	0.34	0.7
24.....	2.18	114	1.15	32	0.44	2.0	0.35	0.8
25.....	2.00	98	1.10	29	0.40	1.4	0.40	1.4
26.....	1.85	84	1.25	38	0.45	2.2	0.55	4.2
27.....	1.68	70	1.30	42	0.40	1.4	0.56	4.5
28.....	1.67	70	1.25	38	0.48	2.7	0.57	4.8
29.....	1.69	71	1.25	38	1.20	35.0	0.64	6.9
30.....	1.74	75	1.25	38	1.30	42.0	0.64	6.9
31.....			1.20	35			0.64	6.9

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DI-CHARGE of Battle Creek at Nash's Ranche, Sask., for 1911.—*Con.*

Day.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0 63	6 6	0 38	1 2	1 32	43 0	1 35	46 0
2	0 65	7 3	0 50	3 0	1 30	42 0	1 44	52 0
3	0 67	8 0	0 60	5 5	1 28	41 0	1 43	51 0
4	0 67	8 0	0 70	9 0	1 25	38 0	1 45	52 0
5	0 64	6 9	1 19	34 0	1 25	38 0	1 34	45 0
6	0 71	9 4	5 47	566 0	1 28	41 0	1 25	38 0
7	0 73	10 3	5 43	558 0	1 44	52 0	1 24	38 0
8	0 75	11 0	4 75	434 0	1 34	45 0	1 50	56 0
9	0 85	16 0	4 00	320 0	1 30	42 0	1 32	43 0
10	0 90	18 0	3 25	225 0	1 25	38 0	1 25	38 0
11	0 98	22 0	2 65	160 0	1 25	38 0	1 30	42 0
12	1 00	23 0	2 35	130 0	1 24	38 0	1 43	51 0
13	1 02	24 0	2 10	107 0	1 20	35 0	1 38	48 0
14	0 76	11 0	1 90	89 0	1 20	35 0	1 40	49 0
15	0 88	17 0	1 75	76 0	1 20	35 0	1 42	50 0
16	0 84	15 0	1 65	68 0	1 17	33 0		
17	0 84	15 0	1 57	62 0	1 10	29 0		
18	0 75	11 0	1 50	56 0	1 12	30 0		
19	0 70	9 0	1 40	49 0	1 15	32 0		
20	0 68	8 3	1 35	46 0	1 20	35 0		
21	0 65	7 3	1 42	50 0	1 21	36 0		
22	0 63	6 6	1 43	51 0	1 24	38 0		
23	0 57	4 8	1 55	60 0	1 20	35 0		
24	0 50	3 0	1 40	49 0	1 18	34 0		
25	0 40	1 4	1 43	51 0	1 20	35 0		
26	0 53	3 8	1 50	56 0	1 20	35 0		
27	0 50	3 0	1 53	58 0	1 05	26 0		
28	0 48	2 7	1 55	60 0	1 08	28 0		
29	0 45	2 2	1 44	52 0	1 34	45 0		
30	0 43	1 9	1 40	49 0	1 44	52 0		
31	0 38	1 2			1 33	44 0		

MONTHLY DISCHARGE of Battle Creek at Nash's Ranche, Sask., for 1911.

Drainage area, 500 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in Inches on Drainage Area.	Total in Acre-Feet.
April	180	61.0	104.1	0.208	0.232	6,194
May	89	26.0	45.6	0.091	0.105	2,804
June	42	1.2	10.6	0.021	0.023	631
July	38	0.7	9.3	0.019	0.022	572
August	24	1.2	9.5	0.019	0.022	584
September	566	1.2	117.8	0.236	0.263	7,009
October	52	26.0	37.7	0.075	0.086	2,318
November 1-15.	56	38.0	46.6	0.093	0.052	1,386
The period					0.805	21,498

NOTE—To the above must be added the water diverted by Stirling & Nash's ditch, McKinnon's ditch and Richardson's ditch.

MISCELLANEOUS DISCHARGE MEASUREMENTS in Battle Creek, drainage basin, in 1911.

Date.	Hydrographer	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Feet per Sec.</i>	<i>Sec.-ft.</i>
April 18	M. H. French..	Battle Creek.....	Sec. 31-5-27-3	23.4	31.49	3.200	100.840
May 11	"	"	" 36-4-27-3	25.1	28.92	1.470	42.520
June 5	"	"	"	"	"	"	18.750
July 11	"	"	"	28.0	17.61	1.030	18.250
Aug 10	J. Kay.....	"	S.E. 1-6-28-3.	31.0	40.08	0.817	32.640
Aug 16	M. H. French..	"	Sec. 13-8-1-4	"	1.50	1.360	2.040
June 26	J. Kay.....	Fourmile Coulee.....	11-8-29-3	4.25	3.51	3.660	12.840
June 26	R. J. Burley	"	"	4.40	2.87	3.400	9.760
July 1	M. H. French..	"	"	4.50	2.91	2.520	7.330
June 16	"	Grayburn Creek.....	13-8-1-4	"	4.04	0.559	2.260
Aug. 16	"	"	"	7.80	3.44	0.540	1.860
Aug. 15	"	Mink Creek	" 31-7-29-3	x	"	"	0.213
June 9	"	Marshall Gaff's Ditch.	" 26-5-29-3.	"	4.77	1.270	6.070
July 6	"	"	" 34-5-29-3	6.00	7.13	0.808	5.760
June 16	"	Ninemile Coulee.....	" 36-7-30-3.	"	2.34	0.777	1.820
Aug. 15	"	"	"	5.23	2.29	0.663	1.450
Aug. 17	"	Sixmile Coulee.....	" 12-8-29-3.	"	1.63	0.687	1.100
June 17	"	Spring Creek.....	" 21-7-29-3.	x	"	"	0.227
June 17	"	"	" 31-7-29-3.	x	"	"	0.295

x Weir measurement.

FRENCHMAN RIVER DRAINAGE BASIN.

General Description.

Frenchman River drains the greater portion of southwestern Saskatchewan. It rises in Cypress Lake in Tp. 6, Rge. 26, W. 3rd Mer., and follows a southeasterly course for some 150 miles, crossing into the United States in Tp. 1, Rge. 10, west of the 3rd Meridian. It eventually finds its way into Milk River near Salt, Montana, and therefore forms a part of the general drainage basin of the Missouri.

Cypress Lake is on the southern slope of the Cypress Hills at an elevation of about 3240 feet above sea level. It occupies what is probably a portion of an abandoned watercourse, or channel, of an ancient river, which joined Battle Creek to the Frenchman River. The water of the lake is fresh, and is supplied by a number of coulees and small streams which head in the hills to the north. The largest of these are Oxarart and Sucker Creeks, both of which have a small continuous flow.

During dry years Cypress Lake does not overflow and the whole discharge of the Frenchman River is derived from Belanger, Davis and Fairwell Creeks and the north branch. From Tp. 6, Rge. 23, W. 3rd Mer., where the north branch joins the main stream, there is no appreciable supply to the river while in Canada. Mule Creek, which joins the river in Tp. 5, Rge. 17, W. 3rd Mer., and Snake Creek in Tp. 3, Rge. 13, W. 3rd Mer., however, have a small flow.

The country surrounding Cypress Lake is of rolling prairie much broken by coulees. In many of these there is considerable tree growth but for the most part the country is devoid of all vegetation other than grasses. All the streams in the upper section of the drainage basin, with the exception of the north branch, rise on the plateau at the top of the hills. Flowing southward they break through deep, well-wooded gorges before reaching the lower flats along the river. The north branch, however, is in a deep valley throughout its entire length, its feeders, like the western tributaries of the main stream, cutting through from the bench to the valley, in deep, well-wooded coulees. Below the mouth of the north branch there is little tree growth. Here and there along the river may be found small growths of shrubs and maple, while up on the hill-sides in some of the coulees there are small clumps of poplar covering an acre or so. Most of these coulees are rapidly becoming cleared by the settlers who are taking up the benches above the river valley. The benchlands are well covered with grasses, but the hills and sides of the valley are almost devoid of all vegetation. In the flats along the river, except where irrigated, the chief vegetation consists of sage brush and cactus.

When the Frenchman River leaves the lake it flows through a wide flat valley as far as the mouth of Fairwell Creek. Most of this land is under proposed or constructed irrigation ditches, covering an area of about 500 acres. Below this point the valley becomes more broken and narrows considerably, while the hill-sides become higher. Small portions of this bottom will no doubt be brought under irrigation, but as yet little has been done in that direction.

Below the junction of the north branch the valley becomes rough and rugged, the sides being cut with buttes and deep coulees. Here numerous outcroppings of lignite may be seen

SESSIONAL PAPER No. 25d

and also a wide band of light-colored clay and sand. This band, which has been bleached almost a pure white, may be seen at many points along the river's entire course and is one of the most conspicuous objects in this region. From its color and nature the river receives its local name of the "Whitemud."

At East End, some miles lower down, the valley again breaks out into wide flats. Here is located the largest irrigation project in the Cypress Hills district. Messrs. Enright and Strong have constructed a large dam across the river and a system of ditches and storage reservoirs enabling them to irrigate about 2870 acres. Directly above this project there are two smaller schemes covering 690 acres. Just below, Messrs. Morrison Bros. have a dam and ditch which will irrigate 1200 acres. Their ditch is carried across the river and continued by Messrs. Duncan and Watson, who irrigate some 865 acres more.

This East End flat is of a sandy nature and when under irrigation it has been found that considerable portions of the water used finds its way back to the stream in a short distance. A series of measurements made August 31, 1911, after the flat had been well soaked by rains and irrigation, shows this to be true. Measurements made at Morrison's dam showed that about fifty per cent of the water flowing in Enright and Strong's ditch had again reached the river at this point. At Duncan's house it was found that eighty per cent of the discharge of Morrison's ditch had returned to the river. From Duncan's house to the mouth of Mule Creek there was a loss of about 45 per cent, due, no doubt, to seepage and evaporation.

Below the East End flat none of the flats, which occur at various points along the river, are irrigated as yet. A short distance below the mouth of Snake Creek the river enters bad lands which continue into the United States.

The mean annual rainfall of this basin is not well established, but it is estimated that it would range from 12 to 16 inches, most of which falls in May, June and July. From November to April streams are frozen over and usually there is an abundant snow-fall.

In order to get better records of the discharge of Frenchman River, two cable stations were erected on the upper part of the river, late in the fall of 1911. On account of the winter setting in, they were not quite completed and as no discharge measurements were made, the descriptions are not given in this report. They will be used during the season of 1912. The upper station is located at Gordon's ranche in Tp. 6, Rge. 24, W. 3rd Mer., which is above the mouth of the north branch. The lower station is located at Phillip's ranche in Tp. 6, Rge. 23, W. 3rd Mer., and is below the junction of the north branch but above the irrigation ditches in the vicinity of East End.

OXARART CREEK AT WYLIE'S RANCHE.

This station was established June 15, 1909, by H. R. Carscallen. It is located on N.W. $\frac{1}{4}$ Sec. 20, Tp. 6, Rge. 27, W. 3rd Mer., near the mouth of the creek and about thirty-five miles south of Maple Creek. It is above the intake of Joseph Wylie's irrigation ditch.

The channel is straight for ten feet upstream and then divides into four small courses. It is straight for about twenty feet downstream, then strikes an earth dam used in diverting water into Mr. Wylie's irrigation ditch. The stream has a considerable fall, and is subject to sudden and extreme floods, necessitating the replacing of the dam below the station after every flood. This brings the records of gauge-height observations under new sets of conditions, and a different rating curve must be constructed for each change of conditions. The creek has several channels during high stages, and the station, although unsatisfactory, is the only section to be found, within reach of an observer, where the total flow is contained in one channel during the low water period. The bed of the stream is composed of sand and coarse gravel. The current is sluggish at the station during low water.

The gauge, which is a plain staff graduated to feet and hundredths, is attached to a vertical post sunk in the bed of the stream at the left bank and securely stayed to the bank. The gauge is referred to bench marks as follows:—(1) a spike-head in the top of the final-point stake on the right bank (elevation 5.75 feet above the zero of the gauge); (2) the top of three nails driven horizontally into a large willow tree, blazed and marked "B.M.," and about twenty feet from the gauge (elevation 4.41 feet above the zero of the gauge).

Discharge measurements are made a short distance above the station by wading. The initial point for soundings is a square stake driven close to the ground on the left bank and marked "I.P."

During 1911, the gauge was read by Frank Wylie.

DISCHARGE MEASUREMENTS of Oxarart Creek at Wylie's Ranche, Sask., in 1911.

Date	Hydrographer	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 16.....	M. H. French	37.0	44.06	0.347	1.78	15.280
May 9.....	do	25.0	16.88	0.146	1.06	2.460
June 3.....	do	28.5	14.48	0.142	1.12	2.064*
July 12.....	do		11.96	0.113	1.00	1.354*
Aug. 3.....	do		10.26	0.096	0.89	0.986*
Aug. 26.....	do		8.88	0.084	0.85	0.738*
Sept. 21.....	do		8.65	0.086	0.85	0.748*
Oct. 25.....	do	24.0	8.92	0.087	0.85	0.781*

* Discharge measured with a weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Oxarart Creek at Wylie's Ranche, Sask., for 1911.

Day.	April		May.		June.		July.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.80	15.8	1.20	3.3	1.12	2.5	1.06	2.0
2.....	1.80	15.8	1.45	7.2	1.12	2.5	1.07	2.1
3.....	1.80	15.8	1.87	18.0	1.12	2.5	1.07	2.1
4.....	1.80	15.8	1.90	18.9	1.11	2.4	1.07	2.1
5.....	1.80	15.8	1.74	14.1	1.11	2.4	1.06	2.0
6.....	1.80	15.8	1.48	7.8	1.12	2.5	1.05	1.9
7.....	1.90	18.9	1.20	3.3	1.12	2.5	1.05	1.9
8.....	1.90	18.9	1.15	2.8	1.10	2.3	1.05	1.9
9.....	1.90	18.9	1.15	2.8	1.10	2.3	1.04	1.8
10.....	1.90	18.9	1.10	2.3	1.08	2.1	1.03	1.7
11.....	1.80	15.8	1.08	2.1	1.08	2.1	1.02	1.7
12.....	1.80	15.8	1.05	1.9	1.07	2.1	1.00	1.5
13.....	1.90	18.9	1.05	1.9	1.07	2.1	1.00	1.5
14.....	1.90	18.9	1.05	1.9	1.07	2.1	1.00	1.5
15.....	1.90	18.9	1.05	1.9	1.07	2.1	1.00	1.5
16.....	1.80	15.8	1.05	1.9	1.07	2.1	0.99	1.4
17.....	1.84	17.0	1.05	1.9	1.08	2.1	0.99	1.4
18.....	1.50	8.2	1.10	2.3	1.08	2.1	0.98	1.4
19.....	1.69	12.7	1.10	2.3	1.07	2.1	0.98	1.4
20.....	1.75	14.4	1.05	1.9	1.08	2.1	0.98	1.4
21.....	1.70	13.0	1.10	2.3	1.09	2.2	0.96	1.3
22.....	1.66	12.0	1.12	2.5	1.09	2.2	0.96	1.3
23.....	1.21	3.4	1.12	2.5	1.09	2.2	0.94	1.2
24.....	1.18	3.1	1.10	2.3	1.10	2.3	0.93	1.2
25.....	1.15	2.8	1.10	2.3	1.08	2.1	0.92	1.1
26.....	1.12	2.5	1.11	2.4	1.08	2.1	0.92	1.1
27.....	1.08	2.1	1.11	2.4	1.07	2.1	0.92	1.1
28.....	1.05	1.9	1.11	2.4	1.07	2.1	0.90	1.0
29.....	1.03	1.7	1.10	2.3	1.07	2.1	0.90	1.0
30.....	1.00	1.5	1.10	2.3	1.06	2.0	0.90	1.0
31.....			1.10	2.3			0.89	1.0

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Oxarart Creek at Wylie's Ranche, Sask., for 1911—*Con.*

DAY.	August.		September.		October.		November	
	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1..	0.89	1.0	0.85	0.8	0.85	0.8	0.85	0.8
2...	0.89	1.0	0.85	0.8	0.85	0.8	0.85	0.8
3...	0.89	1.0	0.85	0.8	0.85	0.8	0.85	0.8
4...	0.89	1.0	1.38	5.9	0.85	0.8	0.85	0.8
5...	0.89	1.0	1.38*	5.9	0.85	0.8	0.85	0.8
6..	0.89	1.0	1.38*	5.9	0.85	0.8	0.85	0.8
7..	0.89	1.0	1.36	5.6	0.85	0.8	0.85	0.8
8..	0.89	1.0	1.30	4.6	0.85	0.8	0.85	0.8
9...	0.89	1.0	1.10	2.3	0.85	0.8	0.85	0.8
10...	0.89	1.0	0.85	0.8	0.85	0.8	0.85	0.8
11...	0.89	1.0	0.85	0.8	0.85	0.8	0.85	0.8
12...	0.89	1.0	0.85	0.8	0.85	0.8	0.85	0.8
13...	0.85	0.8	0.85	0.8	0.85	0.8	0.85	0.8
14...	0.85	0.8	0.85	0.8	0.85	0.8	0.85	0.8
15...	0.85	0.8	0.85	0.8	0.85	0.8	0.85	0.8
16...	0.85	0.8	0.85	0.8	0.85	0.8		
17...	0.85	0.8	0.85	0.8	0.85	0.8		
18..	0.85	0.8	0.85	0.8	0.85	0.8		
19...	0.85	0.8	0.85	0.8	0.85	0.8		
20...	0.85	0.8	0.85	0.8	0.85	0.8		
21...	0.85	0.8	0.85	0.8	0.85	0.8		
22...	0.85	0.8	0.85	0.8	0.85	0.8		
23...	0.85	0.8	0.85	0.8	0.85	0.8		
24...	0.85	0.8	0.85	0.8	0.85	0.8		
25...	0.85	0.8	0.85	0.8	0.85	0.8		
26..	0.85	0.8	0.85	0.8	0.85	0.8		
27..	0.85	0.8	0.85	0.8	0.85	0.8		
28..	0.85	0.8	0.85	0.8	0.85	0.8		
29..	0.85	0.8	0.85	0.8	0.85	0.8		
30..	0.85	0.8	0.85	0.8	0.85	0.8		
31..	0.85	0.8			0.85	0.8		

* Gauge-height only approximate.
NOTE.—Discharge during October and November from Springs just above the Station.

MONTHLY DISCHARGE of Oxarart Creek at Wylie's Ranche, Sask., for 1911.
(Drainage area, 73 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET				RUN-OFF.	
	Maximum	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage Area.	Total in acre-feet.
April.	18.9	1.5	12.4	0.170	0.190	738
May.	18.9	1.9	4.1	0.056	0.065	252
June	2.5	2.0	2.2	0.030	0.034	131
July.....	2.1	1.0	1.5	0.021	0.024	92
August	1.0	0.8	0.9	0.013	0.015	55
September	5.9	0.8	1.6	0.022	0.024	95
October	0.8	0.8	0.8	0.011	0.013	49
November 1-15	0.8	0.8	0.8	0.011	0.006	24
The period					0.371	1436

NOTE—Run-off for October and November caused by springs just above the gauging station.

SUCKER CREEK AT WHITECOMB AND ZEIGLER'S RANCHE.

This station was established May 26, 1909, by H. R. Carscallen. It is located on the N.W. ¼ Sec. 24, Tp. 6, Rge. 26, W. 3rd Mer., about five miles south of Belanger post office and about thirty-two miles south of Maple Creek.

The channel is straight for 25 feet above and 45 feet below the station. The right bank is comparatively low, sparsely covered with brush, and will overflow at high stages. The left bank is high, free from brush at the station, and not liable to overflow. The bed of the stream is composed of sand and coarse gravel. The current is sluggish at the station, but swift immediately below.

The gauge, which is a plain staff graduated to feet and hundredths, is attached to a vertical post sunk in the bed of the stream at the left bank and securely stayed to the bank. It is referred to bench marks as follows:—(1) a circle of nail-heads in a log near the ground at the northeast corner of a stable (elevation, 12.27 feet above the zero of the gauge); (2) a spike-head in the top of the initial-point stake on the left bank, marked "B.M." (elevation 5.30 feet above the zero of the gauge).

Discharge measurements are made at or near the gauge by wading and at very low stages a weir is used. High-water measurements cannot be made, as the right bank overflows. The initial point for soundings is a square stake driven close to the ground on the left bank and marked "I.P."

During 1911, the gauge was read by Mrs. P. A. Zeigler.

DISCHARGE MEASUREMENTS of Sucker Creek at Whitcomb and Zeigler's Rancho, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 20.....	G. H. Whyte.....	13.9	15.69	1.783	1.42	27.99
May 18.....	do.....	11.0	8.10	0.658	0.81	5.33
June 14.....	do.....	10.6	10.60	0.276	0.60	2.02
July 13.....	do.....	8.41	3.60	0.494	0.58	1.78
Aug. 16.....	do.....	6.61	2.05	0.707	0.56	1.45
Sept. 20.....	do.....	9.1	2.66	1.011	0.655	2.69

DAILY GAUGE HEIGHT AND DISCHARGE of Sucker Creek at Whitcomb and Zeigler's Rancho, Sask., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.			1.20	17.6	0.90	7.4	0.61	2.1
2.			0.90	7.4	1.00	10.1	0.61	2.0
3.			0.70	3.3	1.10	13.5	0.60	2.0
4.			0.70	3.3	1.18	16.7	0.60	2.0
5.			0.70	3.3	1.15	15.5	0.65	2.6
6.			0.75	4.2	1.05	11.7	0.63	2.4
7.			0.79	4.9	0.83	5.8	0.70	3.3
8.			0.82	5.5	0.75	4.2	0.60	3.1
9.			2.60	87.0	0.79	4.9	0.65	2.6
10.			3.12	113.0	0.77	4.6	0.63	2.4
11.			2.80	97.0	0.75	4.2	0.60	2.0
12.			1.50	32.0	0.72	3.7	0.56	1.5
13.			1.30	22.2	0.71	3.5	0.58	1.8
14.			1.20	17.6	0.70	3.3	0.55	1.4
15.			1.13	14.7	0.71	3.5	0.53	1.2
16.			1.10	13.5	0.90	7.4	0.45	0.6
17.			2.02	58.0	0.95	8.7	0.40	0.3
18.			2.31	72.0	0.76	4.4	0.50	0.9
19.			1.75	44.5	0.75	4.2	0.50	0.9
20.			1.45	29.5	0.71	3.5	0.53	1.2
21.			1.55	34.5	0.70	3.3	0.65	2.6
22.			1.43	28.5	0.71	3.5	0.61	2.4
23.			1.28	21.3	0.72	3.7	0.58	1.8
24.			1.02	10.7	0.71	3.5	0.56	1.5
25.			1.00	10.1	0.75	4.2	0.70	3.3
26.	3.3	100	0.95	8.7	0.73	3.8	1.68	41.0
27.	2.6	"	0.85	6.2	0.72	3.7	1.00	10.1
28.	2.0	"	0.90	7.4	0.7	3.3	0.80	5.1
29.	1.1	13.5	0.85	6.2	0.69	3.1	0.70	3.3
30.	1.3	22.2	0.87	6.7	0.67	2.9	0.72	3.7
31.	1.1	13.5			0.65	2.6		

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Sucker Creek at Whitcomb and Zeigler's Rancho, Sask., for 1911.—*Continued.*

DAY	July.		August.		September.		October.		November.	
	Gauge Height	Dis-charge.	Gauge Height	Dis-charge	Gauge Height	Dis-charge.	Gauge Height	Dis-charge	Gauge Height	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	0.82	5.5	0.51	1.0	0.50	0.9	0.68	3.0	0.68	3.0
2.	1.00	10.1	0.53	1.2	0.50	0.9	0.71	3.5		
3.	0.75	4.2	0.54	1.3	0.50	0.9	0.70	3.3		
4.	0.70	3.3	0.55	1.4	0.70	3.3	0.69	3.2		
5.	0.65	2.6	0.55	1.4	0.95	8.7	0.69	3.2		
6.	0.55	1.4	0.70	3.3	1.00	10.1	0.68	3.0		
7.	0.54	1.3	0.70	3.3	1.15	15.5	0.68	3.0		
8.	0.60	2.0	0.60	2.0	0.98	9.5	0.67	2.9		
9.	0.60	2.0	0.68	1.8	0.80	5.1	0.67	2.9		
10.	0.60	2.0	0.57	1.6	0.70	3.3	0.67	2.9		
11.	0.55	1.4	0.56	1.5	0.66	2.7	0.67	2.9		
12.	0.55	1.4	0.56	1.5	0.63	2.4	0.67	2.9		
13.	0.55	1.4	0.55	1.4	0.71	3.5	0.66	2.7		
14.	0.50	0.9	0.52	1.1	0.60	3.2	0.66	2.7		
15.	0.53	1.2	0.55	1.4	0.64	2.5	0.66	2.7		
16.	0.50	0.9	0.53	1.2	0.61	2.1	0.66	2.7		
17.	0.50	0.9	0.51	1.0	0.65	2.6	0.66	2.7		
18.	0.53	1.2	0.50	0.9	0.67	2.9	0.68	3.0		
19.	0.53	1.2	0.50	0.9	0.65	2.6	0.68	3.0		
20.	0.51	1.0	0.50	0.9	0.62	2.2	0.68	3.0		
21.	0.50	0.9	0.50	0.9	0.62	2.2	0.68	3.0		
22.	0.50	0.9	0.50	0.9	0.65	2.6	0.68	3.0		
23.	0.50	0.9	0.50	0.9	0.70	3.3	0.68	3.0		
24.	0.50	0.9	0.50	0.9	0.75	4.2	0.70	3.3		
25.	0.45	0.6	0.55	1.4	0.72	3.7	0.71	3.5		
26.	0.45	0.6	0.60	2.0	0.70	3.3	0.71	3.5		
27.	0.45	0.6	0.56	1.5	0.70	3.3	0.70	3.3		
28.	0.45	0.6	0.51	1.0	0.70	3.3	0.68	3.0		
29.	0.45	0.6	0.50	0.9	0.70	3.3	0.68	3.0		
30.	0.50	0.9	0.50	0.9	0.70	3.3	0.68	3.0		
31.	0.50	0.9	0.50	0.9			0.68	3.0		

MONTHLY DISCHARGE of Sucker Creek at Whitcomb and Zeigler's Rancho, Sask., for 1911.

(Drainage area, 30 square miles.)

MONTH.	DISCHARGE IN SECOND-FOOT				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square mile	Depth in inches on Drainage Area.	Total in acre-feet.
March (26-31).....	22.2	13.5	16.4	0.547	0.061	98
April.....	113.0	3.3	26.4	0.881	0.982	1571
May.....	16.7	2.6	5.8	0.193	0.222	357
June.....	41.0	0.3	3.7	0.123	0.137	220
July.....	10.1	0.6	1.4	0.047	0.054	86
August.....	3.3	0.9	1.4	0.047	0.054	86
September.....	15.5	0.9	3.9	0.130	0.145	232
October.....	3.5	2.7	3.0	0.100	0.115	184
November 1.....	3.0	3.0	3.0	0.100	0.004	61
The period.....					1.774	2895

LONEPINE CREEK AT HEWITT'S RANCHE.

This station was established July 17, 1909, by H. R. Carscallen. It is located on Sec. 27, Tp. 7, Rge. 26, W. 3rd Mer., about two miles west of the surveyed trail from Belanger post office to Maple Creek and about four miles west of Belanger.

The channel is straight for about 35 feet above and 45 feet below the station. The right bank is high and not liable to overflow; the left bank is comparatively low and will overflow at high stages of the stream. The surface of the ground on the left bank is very rough and broken.

The bed of the stream is composed of sand and coarse gravel. The current is smooth and swift. The gauge, which is a plain staff graduated to feet and hundredths, is attached to a vertical post sunk in the bed of the stream at the right bank and securely stayed to the bank. It is referred to bench marks as follows:—(1) a spike-head in the top of the final stake driven close to the ground on the right bank, marked "B.M." in red paint (elevation, 5.63 feet above the zero of the gauge); (2) the head of a spike in the top of a pointed willow stump, blazed and marked "B.M.," on the left bank, 97 feet north of the gauge (elevation, 4.59 feet above the zero of the gauge); (3) the head of a spike in the top of a post driven close to the ground at the east side of a wire corral on the right bank (elevation 10.10 feet above the zero of the gauge). Discharge measurements are made near the gauge by wading and at very low stages a weir is used. The initial point for soundings is a square stake driven close to the ground on the left bank and marked "I.P."

This station is below ditches constructed by A. P. McDonald and S. W. Hewitt, and in the case of water being used in these ditches the records at the gauge would not give the complete discharge of the creek.

During 1911, the gauge was read by S. W. Hewitt.

DISCHARGE MEASUREMENTS of Lonepine Creek at Hewitt's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 20.....	G. H. Whyte.....	3.2	3.05	1.409	1.395	4.30
May 18.....	do	3.6	2.68	0.798	1.150	2.14
June 15.....	do	3.5	1.04	0.317	0.620	0.33
July 13.....	do .....	...	....	....	0.830	0.76*
Aug. 15.....	do .....	...	....	....	0.820	0.84*
Sept. 20.....	do .....	...	....	....	0.950	1.18*

* Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Lonepine Creek at Hewitt's Ranche, Sask., for 1911.

DAY.	April.		May.		June.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	...	...	1.45	4.7	0.98	1.4
2.....	...	...	1.40	4.3	0.95	1.2
3.....	...	...	1.40	4.3	0.90	1.0
4.....	...	...	1.45	4.7	1.10	2.0
5.....	...	...	1.45	4.7	1.60	5.9
6.....	...	...	1.35	3.9	1.25	3.1
7.....	...	...	1.21	2.8	1.25	3.1
8.....	...	...	1.23	2.9	1.18	2.6
9.....	...	...	1.23	2.9	1.13	2.2
10.....	...	...	1.30	3.5	0.89	1.0
11.....	...	...	1.27	3.3	0.70	0.5
12.....	...	...	1.21	2.8	0.68	0.5
13.....	...	...	1.13	2.2	0.63	0.4
14.....	1.11	2.1	1.14	2.3	0.62	0.3
15.....	1.15	2.4	1.20	2.7	0.62	0.3
16.....	1.15	2.4	1.75	7.1	0.62	0.3
17.....	1.15	2.4	1.40	4.3	0.54	0.2
18.....	1.15	2.4	1.15	2.4	0.56	0.3
19.....	1.45	4.7	1.45	4.7	0.56	0.3
20.....	1.33	3.7	1.24	3.0	0.62	0.3
21.....	1.30	3.5	1.15	2.4	0.61	0.3
22.....	1.35	3.9	1.60	5.9	1.05	1.8
23.....	1.35	3.9	1.31	3.6	1.05	1.8
24.....	1.44	4.6	1.24	3.0	1.06	1.8
25.....	1.44	4.6	1.34	3.8	1.86	8.0
26.....	1.35	3.9	1.30	3.5	1.51	5.2
27.....	2.40	12.9	1.15	2.4	1.00	1.5
28.....	2.20	11.1	1.25	3.1	1.00	1.5
29.....	2.00	9.3	1.10	2.0	0.87	0.9
30.....	1.80	7.5	1.05	1.8	0.86	0.9
31.....	...	...	1.00	1.5	...	...

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Lonepine Creek at Hewitt's Ranche, Sask., for 1911.—
Continued.

DAY.	July.		August.		September.		October.	
	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0 86	0 9	0 75	0 6	0 69	0 5	0 94	1 2
2.....	1 57	5 7	0 75	0 6	0 69	0 5	0 95	1 2
3.....	1 00	1 5	0 75	0 6	0 70	0 5	1 44	4 6
4.....	0 90	1 0	0 76	0 6	1 05	1 8	1 04	1 7
5.....	0 88	0 9	0 78	0 7	1 70	6 7	0 99	1 4
6.....	0 88	0 9	1 74	7 0	1 78	7 3	0 99	1 4
7.....	0 88	0 9	1 34	3 8	1 30	3 5	0 99	1 4
8.....	0 87	0 9	1 34	3 8	1 05	1 8	0 94	1 2
9.....	0 90	1 0	0 88	0 9	0 90	1 0	0 93	1 2
10.....	0 88	0 9	0 87	0 9	0 87	0 9	0 93	1 2
11.....	0 88	0 9	0 85	0 8	0 86	0 9	0 93	1 2
12.....	0 84	0 8	0 81	0 7	0 85	0 8	p.93	1 2
13.....	0 84	0 8	0 79	0 7	0 90	1 0	0 93	1 2
14.....	0 82	0 8	0 79	0 7	0 86	0 9	0 93	1 2
15.....	0 81	0 7	0 81	0 7	0 86	0 9	0 90	1 0
16.....	0 80	0 7	0 76	0 6	0 85	0 8	0 90	1 0
17.....	0 75	0 6	0 75	0 6	1 00	1 5	0 98	1 4
18.....	0 85	0 8	0 75	0 6	1 04	1 7	1 14	2 3
19.....	0 86	0 9	0 73	0 6	1 04	1 7	1 16	2 4
20.....	0 84	0 8	0 70	0 5	1 00	1 5	1 16	2 4
21.....	0 79	0 7	0 86	0 9	1 04	1 7	1 16	2 4
22.....	0 80	0 7	0 76	0 6	1 04	1 7	1 16	2 4
23.....	0 95	1 2	0 74	0 6	0 98	1 4	1 16	2 4
24.....	0 85	0 8	0 70	0 5	0 98	1 4	1 16	2 4
25.....	0 78	0 7	0 72	0 5	0 96	1 3	1 24	3 0
26.....	0 76	0 6	0 95	1 2	0 96	1 3	1 24	3 0
27.....	0 84	0 8	0 74	0 6	0 96	1 3	1 29	†
28.....	0 77	0 6	0 72	0 5	0 95	1 2	1 29	.....
29.....	0 75	0 6	0 70	0 5	0 94	1 2	1 29	.....
30.....	0 74	0 6	0 70	0 5	0 94	1 2	1 29	.....
31.....	0 75	0 6	0 70	0 5			1 29	.....

† Stream frozen.

MONTHLY DISCHARGE of Lonepine Creek at Hewitt's Ranche, Sask., for 1911.
(Drainage area, 8 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in acre-feet.
April (14-30).....	12.9	2.1	5.020	0.628	0.400	169
May.....	7.1	1.5	3.440	0.430	0.496	211
June.....	8.0	0.3	1.690	0.211	0.235	101
July.....	5.7	0.6	0.917	0.122	0.141	60
August.....	7.0	0.5	1.060	0.132	0.152	65
September.....	7.3	0.5	1.660	0.208	0.232	99
October (1-26).....	4.6	1.0	1.820	0.228	0.220	94
The period.....					1.876	799

BELANGER CREEK AT GARISSERE'S RANCHE.

This station was established June 12, 1909, by H. R. Carscallen. It is located on S.W. ¼ Sec. 18, Tp. 7, Rge. 25, W. 3rd Mer., one hundred and fifty yards west of Garissere's ranche (Belanger post office), and about twenty-seven miles south of Maple Creek.

The channel is straight for 100 feet above and 125 feet below the station. Both banks are comparatively high, but will overflow at time of extreme flood. The ground on the left bank is very rough and broken. Both banks are covered with low underbrush at the station and with large willow brush above and below. The bed of the stream is composed of sand and coarse gravel. The current is moderate at low stages.

The gauge, which is a plain staff graduated to feet and hundredths, is attached to a vertical post sunk in the bed of the creek at the left bank and securely stayed to the bank. It is referred to a bench-mark consisting of the head of a spike surrounded by a circle of nail-heads in the top of the initial-point stake on the left bank, marked "B.M." in red paint (elevation, 7.27 feet above the zero of the gauge).

Discharge measurements are made at the station by wading. No measurements can be made at extreme flood stage, as the banks overflow and make wading impossible. The initial point for soundings is a square stake driven close to the ground on the left bank and marked "I.P."

During 1911, the gauge was read by G. C. Garissere.

DISCHARGE MEASUREMENTS of Belanger Creek at Garissere's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 20.....	G. H. Whyte.....	18.3	16.76	1.160	1.755	19.42
May 18.....	do.....	18.4	11.75	0.517	1.540	6.08
June 15.....	do.....	17.5	13.40	0.456	1.500	6.11
July 13.....	do.....	17.8	12.72	0.390	1.500	4.97
Aug. 16.....	do.....	17.0	12.34	0.283	1.420	3.49
Sept. 20.....	do.....	17.0	11.10	0.309	1.405	3.43

DAILY GAUGE HEIGHT AND DISCHARGE of Belanger Creek at Garissere's Ranche, Sask., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.40	3.2				
2.....			1.40	3.2				
3.....			1.50	6.1				
4.....			1.50	6.1				
5.....			1.60	10.4				
6.....			1.60	10.4				
7.....			1.60	10.4				
8.....			1.70	16.0				
9.....			2.00	36.5				
10.....			2.10	43.5				
11.....			2.00	36.5				
12.....			1.90	29.5				
13.....			1.70	16.0				
14.....			1.70	16.0				
15.....	2.55	75.0	1.70	16.0				
16.....	2.30	57.5	1.70	16.0				
17.....	2.00	36.5		†				
18.....	2.00	36.5						
19.....	2.10	43.5						
20.....	2.10	43.5						
21.....	1.90	29.5						
22.....	1.90	29.5						
23.....	1.80	22.6						
24.....	1.80	22.6						
25.....	1.60	10.4						
26.....	1.60	10.4						
27.....	1.50	6.1						
28.....	1.50	6.1						
29.....	1.50	6.1						
30.....	1.40	3.2						
31.....	1.40	3.2						

DAILY GAUGE HEIGHT AND DISCHARGE of Belanger Creek at Garissere's Ranche, Sask., for 1911.—
Continued.

DAY.	July.		August.		September.		October.		November.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1					1.28	1.1	1.42	3.8	1.28	1.1
2					1.28	1.1	1.43	4.0	1.28	1.1
3					1.40	3.2	1.43	4.0	1.28	1.1
4					1.40	3.2	1.43	4.0	1.29	1.2
5					1.43	4.0	1.43	4.0	1.29	1.2
6					1.43	4.0	1.43	4.0	1.29	1.2
7					1.43	4.0	1.30	1.3	1.28	1.1
8					1.30	1.3	1.29	1.2	1.28	1.1
9					1.30	1.3	1.29	1.2	1.27	0.9
10					1.31	1.5	1.29	1.2	1.27	0.9
11					1.31	1.5	1.29	1.2	1.28	1.1
12			†		1.32	1.6	1.40	3.2	1.29	1.2
13			1.43	3.8	1.33	1.8	1.40	3.2	1.27	0.9
14			1.43	3.7	1.33	1.8	1.40	3.2	1.28	1.1
15			1.42	3.6	1.33	1.8	1.42	3.8	1.28	1.1
16			1.42	3.5	1.33	1.8	1.44	4.3	1.28	1.1
17			1.42	3.8	1.34	1.9	1.44	4.3	1.28	1.1
18			1.43	4.0	1.34	1.9	1.42	3.8	1.29	1.2
19			1.43	4.0	1.33	1.8	1.42	3.8	1.27	0.9
20			1.41	3.5	1.35	2.1	1.42	3.8		
21			1.41	3.5	1.39	3.0	1.44	4.3		
22			1.40	3.2	1.40	3.2	1.44	4.3		
23			1.40	3.2	1.40	3.2	1.44	4.3		
24			1.40	3.2	1.40	3.2	1.30	1.3		
25			1.39	3.0	1.40	3.2	1.30	1.3		
26			1.39	3.0	1.42	3.8	1.30	1.3		
27			1.29	1.2	1.41	3.5	1.30	1.3		
28			1.29	1.2	1.39	3.0	1.29	1.2		
29			1.29	1.2	1.39	3.0	1.29	1.2		
30			1.28	1.1	1.39	3.0	1.29	1.2		
31			1.28	1.1			1.28	1.1		

† No observations of Gauge height between 16 April and August 13. No observer.

MONTHLY DISCHARGE of Belanger Creek at Garissere's Ranche, Sask., for 1911.
(Drainage area, 43 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in acre-feet.
March (15-31)	75.0	3.2	26.0	0.605	0.382	877
April (1-16)	43.0	3.2	17.2	0.400	0.238	746
August (13-31)	4.0	1.1	2.9	0.067	0.047	109
September.	4.0	1.1	2.5	0.058	0.065	149
October	4.3	1.1	2.8	0.065	0.075	172
November (1-19)	1.2	0.9	1.1	0.026	0.018	41
The period					.825	1894

NOTE.—No records for period from April 17th to Aug. 12th.

DAVIS CREEK AT DRURY'S RANCHE.

This station was established May 24, 1909, by H. R. Carscallen. It is located on N.E. ¼ Sec. 29, Tp. 6, Rge. 25, W. 3rd Mer., about five miles southeast of Belanger post office, and about half a mile from the mouth of the creek.

The channel is straight for 150 feet above and 200 feet below the station. The right bank is comparatively high and will not overflow except in cases of extreme flood; the left bank is low

and will overflow at high-water stages of the stream. Both banks are covered with brush. The bed of the stream is composed of sand and coarse gravel, and there may be a slight sub-surface flow at this point. The current is swift.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post in the bed of the stream at the right bank and securely stayed to the bank. It is referred to bench marks as follows:—(1) the head of a spike in the top of a pointed willow stump about fifteen feet below the gauge on the right bank, the stump blazed and marked "B.M." with red paint (elevation 5.05 feet above gauge zero); (2) the head of a spike surrounded by a circle of nail-heads in the top of a log projecting from the southeast corner of Mr. Drury's house (elevation, 9.05 feet above gauge zero).

Discharge measurements are made at or near the gauge by wading. Owing to the left bank being low, high-water measurements cannot be made. Considerable annoyance is experienced by the construction of dams below the gauge by beavers.

There are one or two proposed irrigation schemes on the head-waters of this stream, but as yet there has been no diversion of water.

During 1911, the gauge was read by T. A. Drury.

DISCHARGE MEASUREMENTS of Davis Creek at Drury's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 20.....	G. H. Whyte.....	19.5	21.42	2.668	1.47	57.16
May 18.....	do.....	12.0	7.97	1.590	0.90	12.74
June 15.....	do.....	8.8	3.48	0.557	0.58	1.94
July 13.....	do.....	8.6	3.48	0.583	0.61	2.03
Aug. 15.....	do.....	9.0	2.61	0.417	0.54	1.07
Sept. 20.....	do.....	11.0	5.62	1.617	0.78	9.09

DAILY GAUGE HEIGHT AND DISCHARGE of Davis Creek at Drury's Ranche, Sask., for 1911.

DAY.	April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.02	20 0	0 8	8.1
2.....			1.05	22 0	0.74	5.9
3.....			1.09	25 0	0 70	4.6
4.....			1.10	25 0	0 68	4.1
5.....			1.08	24 0	0 70	4.6
6.....			1.01	19 0	0 80	8.1
7.....			0 85	10 0	0 82	9.0
8.....			0 83	9 4	0 77	7.0
9.....			0 80	8 1	0 76	6.6
10.....			0 79	7 7	0.76	6.6
11.....			0.80	8 1	0 67	3.8
12.....			0 81	8 5	0 60	2.2
13.....			0.79	7 7	0 57	1.7
14.....			0 79	7 7	0 55	1.3
15.....			0 81	8 5	0 55	1.3
16.....			1.00	19 0	0 52	0.9
17.....			1.00	19 0	0.50	0.7
18.....			0 90	13 0	0 55	1.3
19.....			0.90	13 0	0 51	1.2
20.....			0 90	13 0	0.55	1.3
21.....			0 83	9 4	0.57	1.7
22.....			0 75	6 2	0.56	1.5
23.....	1.89	95	0 83	9 4	0 56	1.5
24.....	1.87	93	0 88	12 0	0 56	1.5
25.....	1.86	92	0 87	11 0	0 57	1.7
26.....	1.73	81	0 87	11 0	0 95	16.0
27.....	1.32	44	0 90	13 0	0.90	13.0
28.....	1.01	19	0 87	11 0	0.77	7.0
29.....	1.00	19	0 85	10 0	0 70	4.6
30.....	1.00	19	0 84	9 8	6 74	5.9
31.....			0 82	9 0		

DAILY GAUGE HEIGHT AND DISCHARGE of Davis Creek at Drury's Ranche, Sask., for 1911.—*Con.*

DAY.	July.		August.		September		October.	
	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	0.84	9.8	.....	.....	0.40	0.3	0.73	7.1
2.....	1.40	51.0	.....	.....	0.41	0.4	0.72	6.8
3.....	1.06	23.0	.....	.....	0.41	0.4	0.72	6.8
4.....	0.87	11.0	.....	.....	0.42	0.5	0.72	6.8
5.....	†	0.42	0.5	0.72	6.8
6.....	0.45	0.8	0.71	6.4
7.....	0.65	4.9	0.70	6.1
8.....	0.64	4.5	0.70	6.1
9.....	0.60	3.4	0.69	5.8
10.....	0.56	2.8	0.67	5.1
11.....	0.50	1.4	0.65	4.5
12.....	0.47	1.0	0.63	4.0
13.....	0.54	1.2	.....	.....	0.48	1.0	0.62	3.8
14.....	0.50	1.4	0.61	3.5
15.....	0.54	1.1	0.54	2.0	0.61	3.5
16.....	0.53	1.2	0.54	2.0	0.60	3.2
17.....	0.50	1.0	0.54	1.9	.....	.....
18.....	0.49	0.9	0.84	12.9	.....	.....
19.....	0.48	0.9	0.90	15.0	.....	.....
20.....	0.48	0.9	0.78	9.1	.....	.....
21.....	0.45	0.6	0.70	6.1	.....	.....
22.....	0.45	0.6	0.76	8.4	.....	.....
23.....	0.45	0.6	0.75	8.0	.....	.....
24.....	0.44	0.6	0.75	8.0	.....	.....
25.....	0.42	0.4	0.84	12.0	.....	.....
26.....	0.42	0.4	0.84	12.0	.....	.....
27.....	0.42	0.4	0.80	10.0	.....	.....
28.....	0.42	0.4	0.75	8.0	.....	.....
29.....	0.42	0.4	0.75	8.0	.....	.....
30.....	0.42	0.4	0.74	7.5	.....	.....
31.....	0.40	0.3	.....	.....	.....	.....

† No gauge-height observations made until April 23. No observer.
‡ No gauge-height observations made between July 4 and August 15. Observer absent.

MONTHLY DISCHARGE of Davis Creek at Drury's Ranche, Sask., for 1911.
(Drainage area, 45 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
April (23-30).....	95.0	19.0	57.80	1.280	0.381	917
May.....	25.0	6.2	12.90	0.287	0.331	793
June.....	16.0	0.7	4.49	0.100	0.112	267
July (1-4 and 13).....	51.0	1.2	19.20	0.427	0.079	190
August (15-31).....	1.2	0.3	0.70	0.015	0.009	24
September.....	15.0	0.3	5.14	0.114	0.127	306
October (1-16).....	7.1	3.2	5.36	0.119	0.071	171
The period.....	.....	.....	.....	.....	1.110	2668

NOTE.—No records for periods from July 5th to 12th and July 14th to 31st.

BLACKTAIL COULEE AT GARISSERE'S RANCHE.

This station was established August 13, 1909, by H. R. Carscallen. It is located in N.W. ¼ Sec. 30, Tp. 6, Rge. 23, W. 3rd Mer., forty miles southeast of Maple Creek and one-quarter mile upstream from J. Garissere's house.
The channel is straight for 75 feet above and 200 feet below the station. Both banks are high and well wooded. The left bank has a gentle slope, but the right is quite steep. The bed

of the stream is composed of rocks and gravel, allowing a quantity of water to be lost by seepage. The current is swift.

The gauge, which is a plain staff graduated to feet and hundredths, is securely fastened to a poplar post, sunk in the bed of the stream at the left bank and stayed. It is referred to bench-marks as follows: —(1) two spikes driven into a poplar tree on the right bank, 30 feet upstream, and marked "B.M." (elevation, 7.76 feet above gauge zero); (2) a spike in a stump on the right bank, 15 feet upstream, and marked "B.M." (elevation, 7.61 feet above gauge zero).

Discharge measurements are made during high water with a meter, and in low water a weir is used. The initial point of sounding is a stake driven into the left bank and marked "I.P."

Water is diverted for irrigation purposes by J. Garissere at a point about 150 yards below the station.

During 1911, the gauge was read by J. Garissere.

DISCHARGE MEASUREMENTS of Blacktail Coulee at Garissere's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 19.....	G. H. Whyte.....	6.0	1.81	0.453	1.28	0.820
May 17.....	do.....	6.5	1.57	0.370	1.10	0.580*
June 14.....	do.....				0.92	0.138*
July 12.....	do.....				0.86	Nil
Aug. 12.....	do.....				Dry	Nil

* Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Blacktail Coulee at Garissere's Ranche, Sask., for 1911.

DAY.	June.		July.		August.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.			1.10	0.5	Dry.	Nil.
2.			1.10	0.5	"	"
3.			1.10	0.5	"	"
4.			1.10	0.5	"	"
5.			1.10	0.5	"	"
6.			1.10	0.5	"	"
7.			1.00	0.3	"	"
8.			1.00	0.3	"	"
9.			1.00	0.3	"	"
10.			1.00	0.3	"	"
11.			1.00	0.3	"	"
12.			1.00	0.3	"	"
13.		†	1.00	0.3	"	"
14.	1.10	0.5	0.90	0.1	"	"
15.	1.10	0.5	0.90	0.1	"	"
16.	1.10	0.5	0.90	0.1	"	"
17.	1.10	0.5	0.90	0.1	"	"
18.	1.10	0.5	0.90	0.1	"	"
19.	1.00	0.4	0.80	0	"	"
20.	1.00	0.4	0.80	0	"	"
21.	1.00	0.4	0.80	0	"	"
22.	1.00	0.4	0.80	0	"	"
23.	1.00	0.4	0.80	0	"	"
24.	1.10	0.5	0.80	0	"	"
25.	1.10	0.5	0.80	0	"	"
26.	1.20	0.7	0.60	0	"	"
27.	1.20	0.7	0.60	0	"	"
28.	1.20	0.7	0.20	0	"	"
29.	1.20	0.7	0.20	0	"	"
30.	1.10	0.5	0.10	0	"	"
31.			0.10	0	"	"

† Could not secure an observer before June 14th.

* No observations after this date. Probably a small flow in early part of September but dry during the rest of the Fall.

SESSIONAL PAPRE No. 25d

MONTHLY DISCHARGE of Blacktail Coulee at Garissere's Ranche, Sask., for 1911.

(Drainage area, 20 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
June (14-30).....	0.7	0.4	0.520	0 026	0.016	18
July.....	0.5	0.0	0.181	0 009	0.010	11
The period					026	29

FAIRWELL CREEK AT BEWLEY'S RANCHE.

This station was established June 10, 1909, by H. R. Carscallen. It is located about eleven miles southeast of Belanger Post Office, at Bewley's ranche, on N.W. $\frac{1}{4}$ Sec. 30, Tp. 6, Rge. 24 W. 3rd Mer.

The channel is straight for 75 feet upstream, but curves slightly to the right for 50 feet downstream. Both banks are comparatively low, and will overflow at high stages of the stream. The banks are covered with brush above and below the station. The bed of the stream is composed of sand and coarse gravel. The current is sluggish at the station, but is swift a short distance below.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post sunk in the bed of the stream at the left bank and securely stayed to the bank. It is referred to bench-marks as follows:—(1) the head of a spike driven into the pointed top of a willow stump about 50 feet southeast of the gauge, the stump blazed and marked "B.M." with red paint (elevation, 6.25 feet above the datum of the gauge); (2) the head of a spike surrounded by a circle of nail-heads in a notch cut in a large poplar tree 60 feet southeast of the gauge, the tree blazed and marked "B.M." with red paint (elevation, 5.08 feet above the datum of the gauge).

Discharge measurements are made by wading a short distance below the gauge. Owing to the low banks high-water measurements cannot be made. The initial point for soundings is a square stake driven close to the ground at the left bank and marked "I.P."

Within a mile upstream from the gauge, the stream is often perfectly dry, while at the gauge and a few miles below it, there is a continuous flow. This disappearance of the stream flow, which occurs for a distance of three or four miles, is due to the loose gravelly character of the stream bed. Beaver dams below the station have given some trouble.

There are a number of proposed irrigation schemes which will take their supply from this stream at points above the gauging station.

During 1911, the gauge was read by R. L. Bewley.

DISCHARGE MEASUREMENTS of Fairwell Creek at Bewley's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
April 19.....	G. H. Whyte.....	63.5	91 95	2.143	3.055	197.14
May 17.....	do	28 5	18.73	2.243	2.300	42.01
June 14	do	52.0	22.18	0.473	1.980	10.83
July 12.....	do				1.960	8.66
Aug. 12.....	do	8.4	5 91	0 648	1.87	3.83
Sept. 25.....	do	8.2	7 93	0.322	1.750	2.55
Oct. 19.....	do	9.4	7.48	1.111	1.920	8.31

DAILY GAUGE HEIGHT AND DISCHARGE of Fairwell Creek at Bewley's Ranche, Sask., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2 30	42 0	2.20	30	1.98	11 0
2.....			2.17	27 0	2.12	22	1.98	11 0
3.....			2 23	34 0	2.12	22	1.98	11 0
4.....			2 10	20 0	2.11	21	1.98	11 0
5.....			2 15	25 0	2.14	24	1.98	11 0
6.....			2 09	19 0	2.11	21	1.98	11 0
7.....			1 96	9 6	2.10	20	1.98	11 0
8.....			2 00	12 0	2.10	20	1.98	11 0
9.....			2 82	140 0	2.06	17	1.98	11 0
10.....			4 37	512 0	2.06	17	1.98	11 0
11.....			3 94	409 0		x	1.98	11 0
12.....			2 80	135 0			1.98	11 0
13.....			2 71	115 0			1.98	11 0
14.....			2 71	115 0			1.98	11 0
15.....			2 70	113 0			1.98	11 0
16.....			4 00	423 0				11 0
17.....			3 62	332 0	2.30	42	1.99	11 0
18.....			3 09	205 0	2.23	34	1.99	11 0
19.....			3 00	183 0		x	1.89	11 0
20.....	1 77	2 9	3.10	207 0			1.99	11 0
21.....	1 80	3.5	2.97	176 0			1.98	11 0
22.....	1 95	9 0	2 90	159 0			1.97	10 0
23.....	2 60	92 0	2 65	109 0			1 97	10 0
24.....	4 10	447 0	2 50	73 0			1.97	10 0
25.....	3 90	399 0	2 50	73 0			1.98	11 0
26.....	3.31	257 0	2.40	56 0			1.98	11 0
27.....	3 20	231 0	2 41	58 0			1.98	11 0
28.....	2 85	147 0	2 26	37 0			1.98	11 0
29.....	2 96	173 0	2 20	30 0			1.98	11 0
30.....	2 70	113 0	2 20	30 0			1.98	11 0
31.....	2 72	117 0						

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Fairwell Creek at Bewley's Ranche, Sask., for 1911.—
Continued.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1 98	11 0	1.83	4 4	1 76	2 7	1 75	2 5
2.....	1 98	11 0	1.82	4 1	1 77	2 9	1 76	2 7
3.....	1 98	11 0	1.83	4 4	1 78	3 1	1 78	3 1
4.....	1 98	11 0	1.83	4 4	1 79	3 3	1 94	8 6
5.....	1 98	11 0	1.84	4 7	1 80	3 5	1 95	9 0
6.....	1 99	11 0	1.85	5 0	1.83	4 4	1.96	9 6
7.....	1 99	11 0	1.85	5 0	1 82	4 1	1.96	9 6
8.....	1 99	11 0	1.85	5 0	1 77	2 9	1 96	9 6
9.....	1 98	11 0	1 84	4 7	1 77	2 9	1.96	9 6
10.....	1 97	10 0	1 84	4 7	1 75	2 5	1.96	9 6
11.....	1 96	9 6	1 83	4 4	1 74	2 3	1.96	9 6
12.....	1 96	9 6	1 82	4 1	1 75	2 5	1.96	9 6
13.....	1 95	9 0	1 81	3 8	1 75	2 5	1.94	8 6
14.....	1 95	9 0	1 81	3 8	1 76	2 7	1 93	8 1
15.....	1 94	8 6	1 80	3 5	1 76	2 7	1 94	8 6
16.....	1 94	8 6	1 81	3 8	1 77	2 9	1 94	8 6
17.....	1 94	8 6	1 81	3 8	1 78	3 1	1 95	9 0
18.....	1 93	8 1	1 79	3 3	1 79	3 3	1 95	9 0
19.....	1 93	8 1	1 79	3 3	1 80	3 5	1 94	8 6
20.....	1 92	7 7	1 79	3 3	1 80	3 5	1 94	8 6
21.....	1 92	7 7	1 78	3 1	1 79	3 3	1 94	8 6
22.....	1 91	7 2	1 78	3 1	1 78	3 1	1 94	8 6
23.....	1 90	6 8	1 77	2 9	1 77	2 9	1 94	8 6
24.....	1 89	6 4	1 77	2 9	1 76	2 7	1 95	9 0
25.....	1 88	6 1	1 78	3 1	1 75	2 5	1 97	10 0
26.....	1 87	5 7	1 78	3 1	1 74	2 3	1 96	9 6
27.....	1 87	5 7	1 77	2 9	1 75	2 5	1 97	10 0
28.....	1 86	5 4	1 77	2 9	1 75	2 5	1 97	10 0
29.....	1 85	5 0	1 76	2 7	1 75	2 5		
30.....	1 84	4 7	1 75	2 5	1 75	2 5		
31.....	1 84	4 7	1 75	2 5				

x No observations between May 11 to 16 and May 19 to 31 owing to absence of observer.

MONTHLY DISCHARGE of Fairwell Creek at Bewley's Ranche, Sask., for 1911.
(Drainage area, 125 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
March (20-31).....	447.0	2.9	166.00	1.330	0.594	3951
April.....	512.0	9 5	129.00	1.030	1.150	7676
May (1-10 and 17-18).....	42.0	17.0	24.20	0.194	0.087	576
June.....	11.0	10.0	10.90	0.087	0.097	649
July.....	11.0	4 7	8.43	0.067	0.077	518
August.....	5.0	2 5	3.72	0.030	0.035	229
September.....	4.4	2 3	2.94	0.024	0.027	175
October (1-28).....	10.0	2 5	8.45	0.068	0.071	469
The period.....					2.138	14243

ROSE CREEK AT EAST END.

This station was established on May 1, 1911, by G. H. Whyte. It is located on the N.E. ¼ Sec. 26, Tp. 7, Rge. 22, W. 3rd Mer., at East End post office.
The channel of the stream is straight for about 40 feet above and 75 feet below the station. The right bank is low and liable to overflow, but the left is high and not liable to overflow. The bed of the stream is composed of sand, which is clear of vegetation, but shifts slightly.

Discharge measurements are made during low water with a weir at a point 100 feet below the gauge, but, at high-water stages, with a current-meter by wading at the gauge. The initial point for soundings is a stake on the left bank.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the left bank. It is referred to bench-marks as follows: (1) a spike-head on the southwest corner of Mr. Rose's barn (elev., 7.67 above the zero of the gauge); (2) a spike-head on the final plug on the right bank and about four inches above ground (elev., 4.97 above the zero of the gauge).

During 1911, the gauge was read by B. E. Rose, postmaster at East End.

DISCHARGE MEASUREMENTS of Rose Creek at East End, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 2.....	G. H. Whyte.....				1.120	0.684*
June 3.....	do				0.960	0.420*
July 5.....	do				1.040	0.520*
July 26.....	do				0.770	0.857*
Aug. 31.....	do				0.765	0.536*
Oct. 4.....	do				1.130	0.711*

* Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Rose Creek at East End, P.O. Sask., for 1911.

DAY.	May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.00	0.45	0.99	0.43	1.22	0.90
2.....	1.12	0.69	0.98	0.41	1.24	0.94
3.....	1.09	0.63	1.00	0.45	1.05	0.55
4.....	1.07	0.59	0.98	0.41	1.04	0.53
5.....	1.04	0.53	1.20	0.86	1.04	0.53
6.....	1.05	0.55	1.06	0.57	1.04	0.53
7.....	1.05	0.55	1.04	0.53	0.95	0.35
8.....	1.05	0.55	1.05	0.55	0.94	0.33
9.....	1.05	0.55	1.00	0.45	1.01	0.47
10.....	1.06	0.57	0.95	0.35	1.00	0.45
11.....	1.11	0.67	0.93	0.31	0.93	0.31
12.....	1.06	0.57	0.90	0.26	0.90	0.26
13.....	1.05	0.55	0.90	0.26	0.86	0.19
14.....	1.26	0.98	0.90	0.26	0.85	0.17
15.....	1.20	0.86	0.90	0.26	0.83	0.14
16.....	1.33	1.13	0.85	0.17	0.82	0.13
17.....	1.23	0.92	0.85	0.17	0.80	0.10
18.....	1.15	0.75	0.85	0.17	0.80	0.10
19.....	1.14	0.73	0.95	0.35	0.85	0.17
20.....	1.15	0.75	1.45	1.38	0.85	0.17
21.....	1.10	0.65	1.33	1.13	0.80	0.10
22.....	1.05	0.55	1.14	0.73	0.75	0.04
23.....	1.24	0.94	1.00	0.45	0.78	0.08
24.....	1.15	0.75	1.25	0.96	0.75	0.04
25.....	1.23	0.92	1.17	0.79	0.73	0.02
26.....	1.20	0.86	1.15	0.75	0.75	0.04
27.....	1.15	0.75	1.00	0.45	0.75	0.04
28.....	1.10	0.65	1.12	0.69	0.75	0.04
29.....	1.09	0.63	1.04	0.53	0.75	0.04
30.....	1.05	0.55	1.25	0.96	0.76	0.05
31.....	1.01	0.47			0.75	0.04

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Rose Creek at East End, P O. Sask., for 1911.—Con.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.75	0.04	0.74	0.03	0.95	0.35	0.95	0.35
2.....	0.75	0.04	0.75	0.04	1.10	0.65	0.95	0.35
3.....	0.75	0.04	0.74	0.03	1.21	0.88	0.95	0.35
4.....	0.75	0.04	1.01	0.47	1.10	0.65	0.95	0.35
5.....	0.81	0.11	x		1.05	0.55	0.95	0.35
6.....	0.87	0.21	x		1.00	0.45	0.96	0.37
7.....	1.02	0.49	1.25	0.96	0.98	0.41	0.96	0.37
8.....	1.00	0.45	1.15	0.75	0.95	0.35	0.90	0.26
9.....	0.90	0.26	1.05	0.55	0.95	0.35	0.91	0.28
10.....	0.85	0.17	0.95	0.35	0.95	0.35	0.90	0.26
11.....	0.89	0.23	0.94	0.33	0.93	0.31	0.91	0.28
12.....	0.80	0.10	0.85	0.17	0.94	0.33	0.85	0.17
13.....	0.75	0.04	0.95	0.35	0.94	0.33	0.85	0.17
14.....	0.75	0.04	0.95	0.35	0.94	0.33	0.88	0.22
15.....	0.85	0.17	0.90	0.26	0.94	0.33	0.85	0.17
16.....	0.75	0.04	0.85	0.17	0.93	0.31		
17.....	0.76	0.05	0.85	0.17	0.93	0.31		
18.....	0.75	0.04	0.95	0.35	0.94	0.33		
19.....	0.75	0.04	0.92	0.30	0.98	0.41		
20.....	0.74	0.03	0.90	0.26	1.00	0.45		
21.....	0.75	0.04	0.86	0.19	0.99	0.43		
22.....	0.75	0.04	0.98	0.41	1.05	0.55		
23.....	0.75	0.04	1.04	0.53	1.00	0.45		
24.....	0.75	0.04	1.05	0.55	1.05	0.55		
25.....	0.74	0.03	1.05	0.55	0.95	0.35		
26.....	0.75	0.04	1.10	0.65	0.94	0.33		
27.....	0.79	0.09	1.04	0.53	0.94	0.33		
28.....	0.74	0.03	0.95	0.35	0.94	0.33		
29.....	0.75	0.04	0.95	0.35	0.94	0.33		
30.....	0.75	0.04	0.95	0.35	0.94	0.33		
31.....	0.74	0.03			0.95	0.35		

MONTHLY DISCHARGE of Rose Creek at East End, Sask., for 1911.

(Drainage area, 13 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
May.....	1.13	0.45	0.69	0.053	0.061	42
June.....	1.38	0.17	0.53	0.041	0.046	32
July.....	0.94	0.02	0.25	0.019	0.022	15
August.....	0.49	0.03	0.10	0.008	0.009	6
September (1-4 and 7-30)*.....	0.96	0.03	0.37	0.028	0.029	21
October.....	0.88	0.31	0.41	0.032	0.037	25
November....(1-15).....	0.37	0.17	0.29	0.022	0.012	9
The period.....					.216	150

* High Water Sept. 5th and 6th. Discharge not available on these dates but would have been greater than the mean.

FRANK CROSS DITCH NEAR EAST END.

This station was established September 9, 1911, by G. R. Elliott on the irrigation ditch of Frank Cross, which diverts water from the north branch of Frenchman River on the N.W. $\frac{1}{4}$ Sec. 15, Tp. 7, Rge. 22, W. 3rd Mer.

The gauge is located on the N.W. $\frac{1}{4}$ Sec. 15, and about 130 feet from the intake of the ditch. It is a plain staff 4 in. x 1 in., graduated to feet and inches, and is on the left side of the sluice flume. The zero of the gauge (elev., 94.45) is referred to a nut on the northwest corner of a bridge at that point (assumed elev., 100.00).

The station is five feet from the end of the sluice flume of the ditch, which has a bottom width of 2.85 feet, with sides 1.8 feet in height.

As this station was established after the irrigation season was over, no gauge-height records were obtained during 1911.

NORTH BRANCH OF FRENCHMAN RIVER AT CROSS'S RANCHE.

This station was established July 25, 1908, by F. T. Fletcher. It is located on N.E. $\frac{1}{4}$ Sec. 16, Tp. 7, Rge. 22, W. 3rd Mer., about two and one half miles from East End post office, and about forty-five miles southeast of Maple Creek, by trail.

The channel is straight for about 100 feet above and 400 feet below the station. Both banks are high and liable to overflow. The bed of the stream is sandy and may shift at high stages. The current is smooth and fairly swift.

The gauge is a plain staff graduated to feet and hundredths, placed vertically at the right bank, about one mile down-stream from the intake of Frank Cross's irrigation ditch, and one hundred yards below his house. The zero of the gauge (elev., 91.28) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated 260 feet northeast of the gauge and about 1315 feet S. 5°36' W. from the northeast corner of Sec. 16, Tp. 7, Rge. 22, W. 3rd Mer.

Discharge measurements are made at or near the gauge by wading. The initial point for soundings is a square hardwood plug driven into the ground on the right bank of the stream and marked "B.M." with white paint.

Irrigation ditches owned by F. Cross, H. Cross and W. F. McNicol take their supply from the North Branch of Frenchman River at points above this station. A small quantity of water was diverted during 1911.

During 1911, the gauge was read by Frank Cross.

DISCHARGE MEASUREMENTS of North Branch of Frenchman River at Cross's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 10.....	G. H. Whyte.....	38.00	89.00	2.329	3.285	207.32
April 18.....	do	14.40	12.49	1.794	0.780	22.40
May 16.....	do	13.60	13.93	1.712	0.870	23.85
June 13.....	do	10.70	5.36	1.076	0.460	5.77
July 11.....	do	10.30	5.54	1.231	0.515	6.82
Aug. 11.....	do	12.30	5.74	1.132	0.495	6.51
Aug. 31.....	G. R. Elliott.....	13.25	4.87	0.786	0.350	3.83
Sept. 6.....	G. H. Whyte.....	13.50	20.44	2.307	1.255	49.37
Oct. 16.....	do	11.00	6.39	1.058	0.540	6.76

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of North Branch of Frenchman River at Cross's Rancho,
Sask., for 1911.

Day.	April.		May.		June.		July.	
	Gauge Height	Dis- charge	Gauge Height.	Dis- charge.	Gauge Height	Dis- charge.	Gauge Height.	Dis- charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	.....	.....	0.7	15.0	0 45	5.8	0 7	15.0
2.....	.....	.....	0.7	15.0	0 45	5 8	0 78	19.0
3.....	.....	.....	0.7	15 0	0 45	5 8	0 58	9.8
4.....	.....	.....	0.7	15 0	0 42	5 0	0 55	8.8
5.....	.....	.....	0.7	15 0	0 55	8 8	0 57	9.4
6.....	.....	.....	0.6	10 5	0 50	7 0	0 55	8.8
7.....	.....	.....	0.6	10 5	0 53	8 0	0 55	8.8
8.....	.....	.....	0.6	10 5	0 53	8 0	0 55	8.8
9.....	.....	.....	0.6	10 5	0 53	8 0	0 60	10.5
10.....	3.5	225.0	0.6	10 5	0 53	8 0	0 60	10.5
11.....	2.2	121.0	0.6	10 5	0 50	7 0	0 55	8.8
12.....	1.9	97.0	0.6	10 5	0 50	7 0	0 50	7.0
13.....	1.7	81.0	0.6	10 5	0 50	7 0	0 50	7.0
14.....	1.6	73.0	0.7	15 0	0 48	6 5	0 48	6.5
15.....	1.0	31.0	0.7	15 0	0 43	5 2	0 48	6.5
16.....	1.2	45.0	0.75	17 5	0 40	4 5	0 47	6.2
17.....	1.3	52.0	0.70	15 0	0 40	4 5	0 47	6.2
18.....	1.0	31 0	0 70	15 0	0 40	4 5	0 47	6 2
19.....	1 0	31 0	0.65	12 8	0 40	4 5	0 50	7.0
20.....	1 0	31 0	0.65	12 8	0 48	6 5	0 50	7.0
21.....	0 9	25 0	0.63	11 8	0 52	7 7	0 50	7.0
22.....	1 0	31 0	0.63	11 8	0 53	8 0	0 50	7.0
23.....	0 7	15 0	0.75	17 5	0 48	6 5	0 50	7.0
24.....	0 7	15 0	0.67	13 6	0 40	4 5	0 48	6.5
25.....	0 7	15 0	0 67	13 6	0 40	4 5	0 47	6.2
26.....	0 7	15 0	0.70	15 0	0 70	15 0	0 45	5.8
27.....	0 7	15 0	0.70	15 0	0 52	7 7	0 45	5.8
28.....	0 7	15 0	0.65	12 8	0 50	7 0	0 43	5.2
29.....	0 7	15 0	0.65	12 8	0 50	7 0	0 43	5.2
30.....	0 7	15 0	0.65	12 8	0 70	15 0	0 48	6.5
31.....	.....	.....	0.60	10 5	.....	.....	0 48	6.5

DAILY GAUGE HEIGHT AND DISCHARGE of North Branch of Frenchman River at Cross's Ranche, Sask., for 1911.—Continued.

DAY.	August.		September		October.		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0.47	6.2	0.46	6.0	0.57	9.4	0.85	†
2	0.47	6.2	0.46	6.0	0.67	13.6	0.84	†
3	0.47	6.2	0.45	5.8	0.71	15.5	0.86	†
4	0.47	6.2	0.72	16.0	0.67	13.6	0.90	†
5	0.54	8.4	0.77	18.5	0.58	9.8	0.84	†
6	0.54	8.4	1.25	48.0	0.57	9.4	0.90	†
7	0.55	8.8	0.75	17.5	0.55	8.8	0.98	†
8	0.62	11.4	0.57	9.4	0.54	8.4	1.01	†
9	0.56	9.1	0.52	7.7	0.53	8.0	1.04	†
10	0.52	7.7	0.51	7.4	0.52	7.7	1.03	†
11	0.50	7.0	0.49	6.8	0.53	8.0	1.23	†
12	0.48	6.5	0.47	6.2	0.54	8.4	1.25	†
13	0.45	5.8	0.53	8.0	0.54	8.4	1.35	†
14	0.44	5.5	0.52	7.7	0.55	8.8	1.51	†
15	0.49	6.8	0.50	7.0	0.55	8.8	1.55	†
16	0.48	6.5	0.50	7.0	0.54	8.4	a	
17	0.46	6.0	0.55	8.8	0.54	8.4		
18	0.46	6.0	0.56	9.1	0.58	9.8		
19	0.45	5.8	0.55	8.8	0.62	11.4		
20	0.45	5.8	0.53	8.0	0.60	10.5		
21	0.45	5.8	0.52	7.7	0.60	10.5		
22	0.45	5.8	0.60	10.5	0.58	9.8		
23	0.48	6.5	0.61	11.0	0.61	11.0		
24	0.48	6.5	0.62	11.4	0.65	12.8		
25	0.45	5.8	0.62	11.4	0.73	16.5		
26	0.54	8.4	0.63	11.8	0.74	17.0		
27	0.53	8.0	0.60	10.5	1.02	32.0		
28	0.48	6.5	0.59	10.2	0.95	28.0		
29	0.47	6.2	0.58	9.8	0.93	27.0		
30	0.46	6.0	0.57	9.4	0.90	25.0		
31	0.46	6.0			0.84			

† No observations previous to April 10.
‡ Ice in stream not sufficient data to compute daily discharge.

MONTHLY DISCHARGE of North Branch of Frenchman River at Cross's Ranche, Sask., for 1911.
(Drainage area, 53 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
April (10-30)	225.0	15.0	47.30	0.892	0.696	1973
May	17.5	10.5	13.20	0.249	0.287	812
June	15.0	4.5	7.01	0.132	0.147	417
July	19.0	5.2	7.95	0.150	0.173	489
August	11.4	5.5	6.83	0.129	0.149	420
September	48.0	5.8	10.80	0.204	0.228	643
October	32.0	7.7	13.40	0.253	0.292	824
The period					1.972	5578

ENRIGHT AND STRONG'S DITCH.

This station was established April 17, 1911, by G. H. Whyte, to replace the station on Sec. 36, Tp. 6, Rge. 22, W. 3rd Mer. The new station, which is located on N.E. ¹/₄ sec. 25, Tp. 6, Rge. 22, W. 3rd Mer., is three-quarters of a mile above the old station and about half a mile below the head-gate of the ditch.



White Clay from which Frenchman River gets its local name "Whitemud." Taken by R. J. Burley.



Enright and Strong's Dam in Frenchman River. Taken by R. J. Burley.

SESSIONAL PAPER No. 25d

Discharge measurements are made at the rod by wading, or from the old bridge station (for description see previous reports). The initial point for soundings at the station is a plug on the left bank, 23 feet from the rod.

The ditch is straight for about 250 feet above and 100 feet below the station. The current is rather sluggish, and during a greater part of the season, vegetation in the ditch causes considerable trouble in making discharge measurements.

The gauge, which is a plain staff graduated to feet and hundredths, is on a post at the right side of the ditch. It is referred to bench marks as follows:—(1) a spike on the initial post, which is about six inches above ground, on the left bank of the ditch (elevation 5.49 feet above the datum of the gauge); (2) the top of a plug, about four inches above ground, on the top of the right bank and about fifty feet downstream from the gauge (elevation 7.52 feet above the datum of the gauge).

During 1911, the gauge was read by J. C. Strong.

DISCHARGE MEASUREMENTS of Enright & Strong's Ditch near East End, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
April 17	G. H. Whyte.					Nil.
May 15	do	14.3	14.70	0.857	1.29	12.60
June 5	do	14.0	12.49	0.817	1.16	10.20
June 12	do	16.0	18.74	1.116	1.49	20.93
July 5	do	12.5	7.98	0.494	0.95	3.95
July 10	do	10.6	5.96	0.490	0.70	2.92
July 27	do	16.0	19.66	0.210	0.92	4.14
Aug 3	do	14.0	10.40	0.460	1.16	4.79
Aug 31	do	11.7	7.78	0.848	0.91	6.60
Oct 14	do					Nil

DAILY GAUGE HEIGHT AND DISCHARGE of Enright & Strong's Ditch near East End, Sask., for 1911.

DAY.	April.		May.		June.		July.		August.		September.	
	Gauge Height	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1					1.00	6.6	1.00	6.6	1.02	3.8	0.90	6.4
2					1.00	6.6	1.00	6.6	1.01	3.4	0.95	7.2
3					1.00	6.6	1.00	6.6	1.16	4.8	0.92	6.7
4					1.00	6.6	0.90	5.1	1.01	3.3	1.00	8.2
5					1.16	9.6	0.95	5.8	1.02	3.5	0.70	3.8
6					1.00	6.6	0.90	5.1	1.03	3.7	0.72	4.0
7					1.00	6.6	0.90	5.1	1.04	4.0	0.50	2.1
8					1.00	6.6	0.91	5.2	1.03	4.1	**	
9					1.00	6.6	0.90	5.1	1.20	6.5		
10			0.80	3.9	0.50	1.5	0.70	2.9	1.20	6.7		
11			0.90	5.1	0.30	0.4	0.90	5.0	1.24	7.7		
12			0.90	5.1	1.49	21.0	0.90	4.9	1.20	7.2		
13			1.00	6.6	0.90	5.1	0.90	4.9	1.22	7.9		
14			1.00	6.6	1.00	6.6	0.91	4.8	1.00	4.7		
15			1.29	13.2	1.00	6.6	1.00	6.1	0.90	3.7		
16			1.00	6.6	1.00	6.6	1.00	6.1	0.75	2.4		
17			1.00	6.6	1.00	6.6	1.02	6.4	1.00	5.1		
18			1.00	6.6	1.00	6.6	1.02	6.2	1.02	5.7		
19			1.00	6.6	1.00	6.6	1.03	6.3	1.00	5.6		
20			1.00	6.6	1.00	6.6	1.02	6.1	1.02	6.1		
21			1.00	6.6	1.00	6.6	1.02	6.0	1.01	6.1		
22	*0.70	2.9	1.00	6.6	1.00	6.6	1.02	5.9	1.03	6.6		
23	0.60	2.1	1.00	6.6	1.00	6.6	1.02	5.5	1.02	6.7		
24	0.60	2.1	1.00	6.6	1.00	6.6	1.04	6.0	1.02	6.9		
25	0.60	2.1	1.00	6.6	1.00	6.6	1.03	5.7	1.00	6.8		
26	0.60	2.1	1.00	6.6	1.00	6.6	1.02	5.5	1.02	7.4		
27	0.60	2.1	1.00	6.6	1.00	6.6	0.92	4.1	1.00	7.3		
28	†		1.00	6.6	1.00	6.6	1.02	5.1	1.00	7.5		
29			1.00	6.6	1.00	6.6	1.03	4.9	1.02	8.1		
30			1.00	6.6	1.00	6.6	1.04	4.6	1.04	8.7		
31			1.00	6.6			1.02	4.0	0.91	6.6		

* Water turned on.
† Water shut off.
** Closed for season.

MONTHLY DISCHARGE of Enright & Strong's Ditch near East End, Sask., for 1911.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
April (22-27).....	2.9	2.1	2.23	.....	.....	26
May (20-31).....	13.2	3.9	6.64	.....	.....	290
June.....	21.0*	0.4	6.75	.....	.....	402
July.....	6.6	2.9	5.44	.....	.....	334
August.....	8.7	2.4	5.76	.....	.....	354
September (1-7).....	8.2	2.1	5.49	.....	.....	76
The period						1482

FRENCHMAN RIVER AT ENRIGHT AND STRONG'S RANCHE.

This station was established July 31, 1908, by F. T. Fletcher. It is located at the Enright and Strong highway bridge on the N.E. ¼ Sec. 31, Tp. 6, Rge. 21, W. 3rd Mer. It is about eight miles south of East End post office and a mile above the East End police detachment. Three miles above the station are the dam and head-gates of Messrs. Enright and Strong's ditch, and hence the discharge of the stream at the station does not include that of the ditch and the latter must be added in order to obtain the total flow of the Frenchman River. The bridge is a single-span, wooden structure set upon timber rock-filled abutments.

The channel is straight for 300 feet above and 600 feet below the station. Both banks are high and not liable to overflow. The bed of the stream is composed of sand and gravel. The current is sluggish.

The gauge, which is of the standard chain type, is fixed to the floor of the east end of the upstream side of the bridge. The length of chain from the marker to the bottom of the weight is 16.80 feet. The zero of the gauge (elev., 85.54) is referred to a permanent iron bench-mark (assumed elev., 100.00), situated 240 feet N 11° E from the gauge. This gauge reads one foot higher than the staff-gauge used during previous years and the early part of 1911.

Discharge measurements are made from the lower side of the bridge during high-water stages, and at a wading section a short distance upstream during low-water stages. The initial point for soundings is the inner face of the left abutment. The bridge is not quite at right angles to the direction of the current.

During 1911, the gauge was read twice each day by J. C. Strong. All gauge-heights for 1911 have been reduced to the datum of the old staff-gauge, so that they can be compared directly with records of previous years.

DISCHARGE MEASUREMENTS of Frenchman River at Enright & Strong's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 13.....	G. H. Whyte.....	38.0	179.00	2.603	4.520	465.95
April 17.....	do	38.0	204.45	2.723	5.155	556.83
April 17.....	do	38.0	239.90	3.933	6.280	943.67
May 3.....	do	40.0	38.78	2.223	2.360	86.21
June 5.....	do	36.0	41.50	0.600	1.550	24.89
July 5.....	do	38.0	60.99	0.709	1.900	49.36
July 10.....	do	37.5	51.87	0.598	1.660	31.04
July 27.....	do	34.0	38.85	0.221	1.320	8.59
Aug. 3.....	do	14.1	4.77	1.180	1.270	5.64
Aug. 31.....	do	13.5	4.00	1.072	1.230	4.31
Oct. 14	do	38.6	38.51	0.743	2.530	29.26

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman River at Enright & Strong's Rancho, Sask.,
for 1911.

DAY.	April.		May.		June.		July.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1..	4 60	4 85	2 50	102	2 00	57	1 85	45
2...	4 40	4 39	2 40	112	2 05	62	1 95	53
3.....	4 40	4 39	2 45	98	2 10	66	1 95	53
4.....	3 90	3 36	2 35	88	1 90	49	2 05	62
5 ..	3 70	3 00	2 45	98	2 00	57	2 05	62
6.....	3 20	2 23	2 40	93	1 90	49	1 95	53
7.....	3 30	2 38	2 30	84	1 90	49	2 00	57
8.....	2 70	1 57	2 05	62	1 85	45	1 85	45
9.....	2 70	1 57	1 70	34	1 80	41	1 72	35
10.....	6 50	9 04	1 80	41	2 00	51	1 62	28
11..	8 40	18 70	8 30	84	2 00	57	1 61	28
12.....	6 50	11 26	2 30	84	1 90	49	1 62	28
13.....	4 70	5 16	2 40	93	1 75	38	1 62	28
14.....	4 00	3 44	2 30	84	1 55	24	1 63	29
15...	3 80	2 95	2 30	84	1 65	30	1 62	28
16.....	2 80	1 44	2 40	93	1 60	27	1 59	26
17.....	5 74	7 38	2 40	93	1 90	53	1 54	23
18..	5 75	7 42	2 30	84	1 75	38	1 53	22
19.....	4 45	3 88	2 25	80	1 65	30	1 52	21
20 ..	4 10	3 19	2 30	84	1 75	38	1 53	22
21.....	4 05	3 10	2 20	75	2 55	107	1 52	21
22 ..	3 90	2 84	2 15	70	1 80	41	1 52	21
23.....	3 70	2 51	2 10	66	1 75	38	1 53	22
24.....	3 30	1 94	2 20	75	1 90	53	1 53	22
25.....	3 10	1 68	2 20	75	1 80	41	1 50	20
26.....	3 00	1 56	2 10	66	1 70	34	1 48	19
27...	2 90	1 44	2 10	66	1 75	38	1 49	19
28 ..	2 75	1 28	2 10	66	1 75	38	1 42	14
29.....	2 65	1 17	2 00	57	1 75	38	1 49	19
30.....	2 45	0 98	2 10	66	1 90	49	1 50	20
31.....	...	...	2 10	66	...	...	1 50	20

DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman River at Enright & Strong's Rancho, Sask., for 1911.—Continued.

DAY.	August.		September		October.		November.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.
1.....	1.47	18	1 31	7 6	2 21	9	1.92	.....
2.....	1.44	16	1 26	5 0	2 31	16	1.68	.....
3.....	1.39	12	1 25	4 5	2 35	18	1.62	.....
4.....	1.41	14	1 26	5 0	2 46	25	1.60	.....
5.....	1.50	20	1 90	49 0	2 52	28	1.52	.....
6.....	1.48	19	2 00	57 0	2 51	27	1.82	.....
7.....	1.46	17	1 70	34 0	2 54	30	2.25	.....
8.....	1.46	17	1 48	19 0	2 62	36	.....	.....
9.....	1.42	14	1 45	16 0	2 62	36	.....	.....
10.....	1.45	16	1 42	14 0	2 59	32	.....	.....
11.....	1.50	20	1 42	14 0	2 62	36	.....	.....
12.....	1.42	19	1 40	13 0	2 61	35	.....	.....
13.....	1.46	17	1 36	11 0	2 62	36	.....	.....
14.....	1.44	16	1 38	12 0	2 61	35	.....	.....
15.....	1.49	19	1 50	20 0	2 60	34	.....	.....
16.....	1.51	21	1 52	21 0	2 58	32	.....	.....
17.....	1.47	18	1 52	21 0	2 45	23	.....	.....
18.....	1.49	19	1 51	21 0	2 51	27	.....	.....
19.....	1.50	20	1 49	19 0	2 50	26	.....	.....
20.....	1.50	20	1 48	19 0	2 51	27	.....	.....
21.....	1.47	18	1.50	20 0	2 55	30	.....	.....
22.....	1.44	16	1 48	19 0	2 59	33	.....	.....
23.....	1.41	14	1 45	16 0	2 65	38	.....	.....
24.....	1.40	13	1.40	13 0	2 71	42	.....	.....
25.....	1.45	16	1.38	12 0	2 70	41	.....	.....
26.....	1.48	19	1 34	9 4	2 72	43	.....	.....
27.....	1.44	16	1 31	7 6	2 67	39	.....	.....
28.....	1.42	14	a2 30d	41 0	2 64	38	.....	.....
29.....	1 40	13	2 95	60 0	2 62	36	.....	.....
30.....	1.37	11	2.45	23 0	2 64	38	.....	.....
31.....	1.31	7.6	.....	.....	2 66	39	.....	.....

a. Flash boards taken off dam.
d. From this date to the end of season, bearer affect gauge heights.

MONTHLY DISCHARGE of Frenchman River at Enright & Strong's Rancho, Sask., for 1911.
(Drainage area,* 683 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
April.....	1870	98.0	401.0	0.587	0.655	23861
May.....	112	34.0	82.9	0.121	0.140	5097
June.....	114	31.0	53.2	0.078	0.087	3166
July.....	68	19.0	36.6	0.054	0.062	2250
August.....	28	14.0	22.2	0.033	0.038	1365
September.....	61	7.6	21.4	0.031	0.035	1273
October.....	43	9.0	31.8	0.047	0.054	1955
The period..	.....	.....	.....	.....	1.071	38967

NOTE.—The Flow through Enright and Strong's ditch has been added to the Flow at the regular station to obtain the total monthly flow of Frenchman river given in this table.

MORRISON BROTHERS' DITCH.

This station was established August 22, 1911, by G. R. Elliott, on Morrison Brothers' irrigation ditch, which diverts water from the Frenchman River on S.E. ¼ Sec. 27, Tp. 6, Rge. 21, W. 3rd Mer.

The gauge is located on the S.W. ¼ Sec. 26, and about half a mile from the intake of the ditch. It is a plain staff 3 in. x 1 in., graduated to feet and inches, and is on the right side of the ditch. The zero of the gauge (elev., 97.36) is referred to the top of a rock 300 feet downstream on the right bank (assumed elev., 100.00) and marked "B.M." with red paint.

The station is at a uniform cross-section of the ditch, which is seven feet wide at the bottom with side slopes of 4 to 1.

As the gauge was established after the irrigation season, no gauge-height records were obtained during 1911.

DISCHARGE MEASUREMENTS of Morrison's Ditch on Frenchman River, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Inches.</i>	<i>Sec.-ft.</i>
Aug. 3.....	G. H. Whyte.....	7.0	3.90	0.703		2.740
Aug. 22.....	F. T. Fletcher.....	16.0	3.96	0.663	8.5	2.639

MULE CREEK AT ERWIN'S RANCHE.

This station was established May 12, 1911, by G. H. Whyte. It is located on the S.E. ¼ Sec. 34, Tp. 5, Rge. 17, W. 3rd Mer. It is about 48 miles by trail from East End and about one-quarter of a mile from the junction of the stream with Frenchman River.

The channel is straight for about 60 feet above and 100 feet below the station. Both banks are high and covered with greasewood and sage brush. The channel is composed of gravel and sand, and is liable to shift.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post near the right bank of the stream. It is referred to bench-marks as follows:—(1) a spike on top of the initial post on the left bank (elevation 5.83 feet above the datum of the gauge); (2) a spike on top of the final post on the right bank (elevation 6.88 feet above the datum of the gauge).

Discharge measurements are made at the rod by means of a current-meter or weir.

As only a few gauge-height observations were made during 1911, and these very unsatisfactory, tables of daily gauge-height and discharge, and monthly discharge could not be prepared.

DISCHARGE MEASUREMENTS of Mule Creek at Erwin's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 12.....	G. H. Whyte.....	5.1	1.25	0.696	0.910	0.870
June 10.....	do	4.8	1.08	0.546	0.800	0.570
Aug. 2.....	do				0.820	0.736*
Sept. 13.....	do				0.950	1.063*
Sept. 13.....	do	4.3	2.12	1.726	1.055	3.660

* Weir measurement.

FRENCHMAN RIVER AT HUFF'S RANCHE.

This station was established on May 23, 1910, by F. H. Peters. It is located in Sec. 5, Tp. 5, Rge. 14, W. 3rd Mer., at Huff's Ranche. It is forty miles by trail from Notre Dame d'Auvergne post office, and seventy-five miles from Swift Current.

During low stages of the stream, discharge measurements are made by wading. The initial point for soundings is the face of post on the left bank, marked "O. + 00." When the stream becomes too deep for wading, the discharge is determined by the slope method.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the left bank. It is referred to the top of the post at the initial point for soundings (elevation, 9.75 feet above the datum of the gauge). It was read, during 1911, by Roy Huff.

The gauge was carried out by ice early in the spring, but was replaced by N. M. Sutherland on June 15. Beaver dams below, which caused back-water on the gauge, and shifting conditions made it impossible to compute daily discharges for 1911. As the gauge-heights are of no value and are misleading, discharges measurements only are given.
565-566-567.

DISCHARGE MEASUREMENTS of Frenchman River at Huff's Rancho, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 15	N. M. Sutherland	4.3	40.84	0.599	2.16	24.46
July 11.....	do				2.20	25.94*
July 28.....	do				1.81	7.09*
Aug 13.....	do				2.05	5.00*

* Measurements made upstream from regular section.

MISCELLANEOUS DISCHARGE MEASUREMENTS in Frenchman River Drainage Basin, in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. Feet.</i>	<i>Feet per Sec.</i>	<i>Sec.-Ft.</i>
July 27.	N.M.Sutherland.	Breed Creek.....	N.W. 12-4-12-3.				Nil.
May 16..	G. H. Whyte....	Calf Creek.....	Sec. 5-8-22-3.	7.5	3.22	1.112	3.590
June 13..	do	do	do	5.7	2.06	0.600	1.360
Aug. 11..	do	do	do	7.5	2.75	0.527	1.448 *
Oct. 16..	do	do	do	5.5	2.17	0.696	1.510
May 17....	do	Concrete Coulee.	Sec. 11-7-23-3...	8.1	4.76	0.666	3.170
June 14..	do	do	do	6.7	3.72	0.319	1.190
July 12..	do	do	do	4.4	2.35	0.476	1.120
Aug. 12..	do	do	do	4.6	1.86	0.535	1.001 *
July 12..	N.M.Sutherland.	Creek.....	Sec. 35-3-12-3.....				Nil.
July 13...	do	do	Sec. 14-2-12-3.	..			Nil.
July 26...	do	do	Sec. 25-4-12-3.	..			Nil.
Aug. 15...	do	do	Sec. 35-3-12-3.	..			Nil.
Aug. 15..	do	do	Sec. 35-2-12-3.	..			Nil.
Aug. 15...	do	do	Sec. 3-2-11-3.	..			Nil.
July 11.	G. H. Whyte ...	A. M. Cross Ditch	Sec. 5-8-22-3.	4.3	1.16	1.050	1.220
May 17..	do	Doyle Coulee....	Sec. 17-7-22-3...	2.0	1.01	0.587	0.590 *
June 14..	do	do	do	1.7	0.68	0.559	0.380 *
Sept. 13	G. R. Elliott....	do	do	..			0.371 *
June 16.	G. H. Whyte....	Dip Creek.....	Sec. 7-8-25-3.	..			0.182 *
June 17..	N.M.Sutherland.	Frenchman Riv..	S.W. 4-1-10-3.	20.6	11.53	2.080	23.940
July 14.	do	do	do	21.0	12.56	2.080	26.140
Aug. 16..	do	do	do	9.4	2.93	0.560	1.650
Aug. 2...	G. H. Whyte. .	do	N.E. 28-5-17-3.	13.6	10.59	0.422	4.470
Sept. 14.	H. T. Thomas...	do	do	46.7	50.44	0.743	37.510
Aug. 3...	G. H. Whyte....	do	Sec. 26-6-21-3.	21.5	13.35	0.431	5.760
Aug. 3...	do	do	Sec. 5-6-20-3.	23.8	14.50	0.554	8.040
Aug. 27..	G. R. Elliott....	North Br. of do.	N.W. 16-8-22-3	4.5	1.86	1.190	2.180
Sept. 6.	R. J. Burley & F. T. Fletcher...	do	N.W. 15-7-22-3.	25.8	30.00	1.800	54.100
Aug. 14..	G. H. Whyte....	Spring Creek.	Sec. 28-7-24-3....				0.706 *
Sept. 13.	G. R. Elliott....	do	Sec. 18-7-22-3.	..			0.314 *
Sept. 14.	R. J. Burley & G. H. Whyte....	do	S.W. 7-6-16-3.	..			0.389 *
Sept. 25	F. T. Fletcher...	do	N.E. 23-6-24-3.	..			0.064 *
July 12.	N.M.Sutherland.	Snake Creek..	S.E. 33-3-13-3.	..			Nil.
July 27.	do	do	do	..			Nil.
Aug. 13..	do	do	do	..			Nil.

* Weir measurement.

SWIFTCURRENT CREEK DRAINAGE BASIN.

General Description.

Swiftcurrent Creek rises in the eastern slope of the Cypress Hills and follows a northeasterly course for 75 miles and then northward for about 25 miles and finally empties into the South Saskatchewan River in Tp. 20, Rge. 13, W. 3rd Mer.

The only important tributary is Bone Creek, which rises in the Cypress Hills and joins the Swiftcurrent in Tp. 10, Rge. 19, W. 3rd Mer.

The main stream flows through a valley two to three hundred feet deep and a mile wide to within a few miles of its mouth, where it enters a sandstone gorge, about five hundred feet deep.

The bench-land above the creek is of rolling prairie broken by innumerable coulees. The soil is a sandy loam. There is very little tree growth along the stream.

The mean annual rainfall at the town of Swift Current is about fifteen inches. This increases slightly at the stream's head-waters. The greatest precipitation occurs during the months of May, June, and July. From November to April the stream is frozen over.

There are a number of small irrigation ditches in this drainage basin, and the town of Swift Current and the Canadian Pacific Railway Company take water for domestic and industrial purposes from the creek.

POLLOCK EAST DITCH AT SOUTH FORK, SASK.

This station was established August 10, 1911, by G. R. Elliott, on the irrigation ditch of Mr. D. Pollock, which diverts water from Swiftcurrent Creek on the N.E. $\frac{1}{4}$ Sec. 22, Tp. 22, Rge. 7, W. 3rd Mer.

The gauge is located on the N.E. $\frac{1}{4}$ Sec. 22, about twenty feet from the intake. The gauge, which is a plain staff graduated to feet and inches, is situated at the left side of the ditch. The zero (elev., 91.96) is referred to a permanent iron bench-mark (assumed elev., 100.00), located at the gauging station on Swiftcurrent Creek, which is three-quarters of a mile below.

The station is at a uniform cross-section of the ditch, which is one and a half feet wide at the bottom with side slopes of one to one and two to one.

No gauge-height observations were made during 1911.

DISCHARGE MEASUREMENTS of Pollock East Ditch at South Fork, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
July 7.....	G. H. Whyte.....	.....	.....	.....	.....	0.240*
July 28.....	do .....	.....	.....	.....	.....	0.268*
Aug. 29.....	do .....	.....	.....	.....	.....	Nil.

* Weir measurement.

POLLOCK WEST DITCH AT SOUTH FORK, SASK.

This station was established August 10, 1911, by G. R. Elliott, on the irrigation ditch of Mr. D. Pollock, which diverts water from Swiftcurrent Creek on the S.W. $\frac{1}{4}$ Sec. 27, Tp. 22, Rge. 7, W. 3rd Mer.

The gauge is located on the N.W. $\frac{1}{4}$ Sec. 22, about half a mile from the intake. The gauge, which is a plain staff graduated to feet and inches, is situated at the right side of a flume. The zero (elev., 82.09) is referred to a permanent iron bench-mark (assumed elev., 100.00) located at the gauging station on Swiftcurrent Creek.

The flume spans a coulee, is constructed of timber, and has a bottom width of two feet, and sides one foot in height.

No gauge-height readings were taken or gaugings made during 1911.

SWIFTCURRENT CREEK AT POLLOCK'S RANCHE, SASK.

This station was established May 18, 1909, by H. R. Carscallen. It is located on the N.E. $\frac{1}{4}$ Sec. 22, Tp. 7, Rge. 21, W. 3rd Mer., about four miles southwest of Southfork post office.

The channel is straight for 50 feet above and 15 feet below the station. Both banks are high and not liable to overflow. The bed of the stream is composed of sand and gravel. The current is moderate at ordinary stages but sluggish at very low stages of the stream.

Discharge measurements are made at or near the gauge by wading at ordinary stages and at very low stages a weir is used. Mr. Pollock diverts water from the creek into an irrigation ditch about half a mile above the gauge, and when he is using water in his ditch the gauge does not record the total flow of the creek.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post sunk in the bed of the stream at the right bank and firmly stayed. The zero of the gauge (elev., 89.25) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated 138 feet N 30° E of the gauge.

During 1911, the gauge was read by D. Pollock.

DISCHARGE MEASUREMENTS of Swiftcurrent Creek at Pollock's Ranche, Sask., in 1911.

Date.	Hydrographer	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 14	G. H. Whyte.....	9.0	7.23	1.116	1.37	8.070
May 4	do	4.6	2.13	0.953	1.22	2.030
June 6	do	4.0	1.80	0.701	0.68	1.300
July 7.....	do	4.8	2.01	0.607	0.74	1.220
July 28.....	do				0.68	0.499*
Aug. 12.....	G. R. Elliott				0.94	1.073*
Aug. 29.....	G. H. Whyte.....				0.88	0.924*
Oct. 5.....	do				0.94	1.602*

* Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek at Pollock's Ranche, Sask., for 1911.

DAY.	May.		June.		July.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			0.80	1.8	0.75	1.3
2			* 0.65	1.3	0.76	1.3
3			0.80	1.8	0.75	1.3
4	0.72	2.0	0.80	1.8	0.72	1.2
5	0.72	2.0	0.68	1.2	0.70	1.1
6....	0.72	2.0	0.68	1.3	0.70	1.1
7.	0.67	1.8	0.68	1.3	0.72	1.1
8.	0.67	1.8	0.68	1.3	0.72	1.1
9.	0.67	1.7	0.67	1.2	0.72	1.1
10.	0.67	1.7	0.67	1.2	0.71	1.1
11.	0.67	1.7	0.66	1.2	0.72	1.0
12.	0.67	1.7	0.65	1.2	0.73	1.0
13.	0.80	2.3	0.65	1.2	0.73	1.0
14.	0.80	2.3	0.65	1.2	0.73	1.0
15	0.85	2.5	0.65	1.2	0.73	1.0
16.	0.90	2.8	0.65	1.1	0.73	0.9
17..	0.85	2.5	0.62	1.1	0.73	0.9
18.	0.85	2.4	0.60	1.0	0.74	0.9
19.	0.76	2.0	0.60	1.0	0.73	0.8
20.	0.76	1.9	0.65	1.1	0.72	0.8
21.	0.76	1.9	0.85	1.7	0.73	0.8
22.	0.76	1.9	0.80	1.5	0.74	0.8
23.	0.76	1.9	0.75	1.3	0.74	0.7
24.	0.80	2.0	0.80	1.7	0.74	0.7
25.	0.80	2.0	0.75	1.3	0.75	0.7
26	0.80	2.0	0.75	1.3	0.75	0.7
27.	0.76	1.8	0.75	1.3	0.75	0.7
28.	0.76	1.8	0.75	1.3	* 0.68	0.5
29.	0.75	1.7	0.75	1.3	* 0.68	0.5
30	0.70	1.5	0.78	1.4	* 0.68	0.5
31	0.80	1.9			* 0.68	0.5

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek at Pollock's Ranche, Sask., for 1911.
Continued.

DAY.	August.		September.		October.		November	
	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1..	*0.68	0.5	0.88	1.0	0.98	1.7	0.98	1.8
2..	*0.68	0.5	0.88	1.0	1.20	2.9	0.98	1.8
3..	*0.66	0.5	0.90	1.0	1.25	3.2	0.98	1.8
4..	*0.67	0.5	0.95	1.2	1.15	2.7	0.98	1.8
5..	0.70	0.5	0.98	1.3	1.00	1.9	0.98	1.8
6..	0.95	1.2	0.98	1.3	0.94	1.6	0.98	1.8
7..	1.50	3.9	0.96	1.2	0.94	1.6		
8..	0.95	1.2	0.96	1.3	0.94	1.6		
9..	0.90	1.0	0.96	1.3	0.94	1.6		
10..	0.88	0.9	0.96	1.3	0.94	1.6		
11..	0.88	0.9	0.98	1.4	0.94	1.6		
12..	0.86	0.9	0.98	1.4	0.94	1.6		
13..	0.80	0.7	0.98	1.4	0.94	1.6		
14..	0.76	0.6	0.98	1.4	0.94	1.6		
15..	0.70	0.5	*0.94	1.3	0.94	1.6		
16..	0.70	0.5	*0.94	1.3	0.94	1.6		
17..	0.75	0.6	*0.94	1.4	0.98	1.8		
18..	0.78	0.7	*0.94	1.4	0.98	1.8		
19..	0.80	0.7	*0.94	1.4	0.98	1.8		
20..	0.85	0.8	*0.94	1.4	0.98	1.8		
21..	0.90	1.0	*0.94	1.4	0.96	1.7		
22..	0.90	1.0	0.98	1.6	0.96	1.7		
23..	0.88	0.9	0.98	1.6	0.98	1.8		
24..	0.88	0.9	0.98	1.6	0.98	1.8		
25..	0.90	1.0	0.96	1.6	0.98	1.8		
26..	0.90	1.0	0.96	1.6	0.98	1.8		
27..	0.88	0.9	0.98	1.7	0.98	1.8		
28..	0.88	0.9	0.98	1.7	0.98	1.8		
29..	0.88	0.9	0.98	1.7	0.98	1.8		
30..	0.88	0.9	0.98	1.7	0.98	1.8		
31..	0.88	1.0			0.98	1.8		

* Water diverted above.

MONTHLY DISCHARGE of Swiftcurrent Creek at Pollock's Ranche, Sask., for 1911.

(Drainage area, 16 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
May (4-31).....	2.8	1.7	1.980	0.124	0.129	110
June	1.8	1.0	1.320	0.082	0.092	79
July.....	1.3	0.5	0.907	0.057	0.066	56
August	3.9	0.5	0.903	0.056	0.065	56
September	1.7	1.0	1.400	0.088	0.098	83
October	3.2	1.6	1.510	0.094	0.108	93
November (1-6).....	1.8	1.8	1.800	0.112	0.025	21
The period.....					.583	498

AXTON EAST DITCH NEAR SOUTH FORK, SASK.

This station was established August 12, 1911, by G. R. Elliott, on the irrigation ditch of J. W. E. Axton, which diverts water from Swiftcurrent Creek on the N.E. 1/4 Sec. 23, Tp. 7, Rge. 21, W. 3rd Mer.

The gauge is located on the N.E. 1/4 Sec. 23, about 40 feet below the intake. The gauge, which is a plain staff, graduated to feet and inches, is on the left side of the ditch. The zero (elev., 97.92) is referred to the top of a plug on the right bank (assumed elev., 100.00).

The station is on a uniform cross-section of the ditch which is two feet wide at the bottom with perpendicular sides.

No records were obtained at this station during 1911, as the gauge was established after the irrigation season.

AXTON WEST DITCH NEAR SOUTH FORK, SASK.

This station was established August 12, 1911, by G. R. Elliott, on the irrigation ditch of J. W. E. Axton, which diverts water from Swiftcurrent Creek on the N.E. 1/4 Sec. 23, Tp. 7, Rge. 21, W. 3rd Mer.

The gauge is located on the N.E. 1/4 Sec. 23, about 33 feet below the intake. The gauge, which is a plain staff graduated to feet and inches, is on the left side of the ditch. The zero (elev., 98.46) is referred to the top of a plug on the left bank (assumed elev., 100.00).

The station is on a uniform cross-section of the ditch, which is three feet wide at the bottom with side slopes of one to one.

No records were obtained at this station during 1911, as the gauge was established after the irrigation season.

JONES COULEE AT READ'S RANCHE, SASK.

This station was established on September 23, 1909, by H. R. Carscallen. It is located on N.E. 1/4 Sec. 5, Tp. 8, Rge. 20, W. 3rd Mer., about 300 yards from the surveyed trail from East End to Gull Lake, and about 42 miles south of Gull Lake. It is about two and a half miles northeast of South Fork post office, and near the mouth of the stream.

The channel is straight for 75 feet above and 50 feet below the station. Both banks are high and not liable to overflow. The banks are free from brush except for a little undergrowth on the left bank. The bed of the stream is composed of soft clay with sand underneath. The current is very sluggish and the water comparatively deep at the station, giving rise to a small amount of vegetation.

Discharge measurements are made a short distance upstream from the gauge by wading and at very low stages a weir is used. The initial point for soundings is a square stake driven close to the ground on the left bank and marked "I.P."

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post sunk in the bed of the creek at the left bank and securely stayed. It is referred to bench-marks as follows:—(1) a spike-head in the top of the final stake driven close to the ground on the right bank and marked "B.M." (elevation, 8.25 feet above gauge zero); (2) the top of two spikes driven horizontally into the end of a log at the northwest corner of Mr. Read's stable, the log marked "B.M." (elevation 11.46 feet above gauge zero).

During 1911, the gauge was read by W. F. Read.

DISCHARGE MEASUREMENTS of Jones Coulee at Read's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 11.....	G. H. Whyte.....	18.0	21.72	0.755	4.32	16.390
May 4.....	do.....	5.5	5.15	0.658	2.14	3.39
June 6.....	do.....	5.0	5.00	0.490	1.84	2.450
July 7.....	do.....	5.3	4.96	0.257	1.84	1.260
July 28.....	do.....				1.54	0.101*
Aug 11.....	G. R. Elliott.....					0.575*
Aug. 29.....	G. H. Whyte.....				1.66	0.311*
Oct 5.....	do.....	4.6	3.75	0.496	2.05	1.860

* Weir measurement.

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Jones Coulee at Read's Ranche, Sask., for 1911.

DAY.	March.		April.		May.		June.		July.		August.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			5 35	26.0	2.20	2.8	1.99	3.1	2.02	2.5	0 96	0.00
2			5.35	26.0	2 03	1 8	1.90	2.6	2 01	2.4	0 98	0.00
3			5 35	26.0	2.01*	1 7	1.97	3.1	2 00	2.3	0 99	0.00
4			5 35	26.0	2.00	1.6	1.70	1.6	2 20	3.6	1 02	0.00
5			5 35	26.0	2.00	1 7	1.76	1.9	2 20	3.5	1.10	0.00
6			5 30	25.0	1.98	1.7	1 76	2 0	2 02	2.3	1 20	0.00
7			5.30	25.0	1.99	1.8	1 70	1 6	2 00	2.1	1 60	0.20
8			5.30	25.0	1.99	1.8	1.80*	2 1	1 98	2.0	2 00	1.60
9			6.40	35.0	2 00	1 9	1 90	2 7	1 95	1.8	2 00	1 60
10			8.60	55.0	2.20	3 2	1.99	3 2	1 93	1.7	1 98	1 50
11			5.30	25.0	2.00	2.0	1 78	1 9	1 91	1.6	1 97	1.50
12			4.00	13.0	1.99	2.0	1 71	1 5	1 89	1.5	1 98	1.50
13			3 98	13.0	1 99	2.1	1 76	1 7	1 87	1.4	1.89	1.20
14			3.99	13.0	2 00	2.2	1 70	1 4	1 83	1.2	1 78	0.70
15			3.98	14.0	2 30	4 3	1 70	1 4	1 80	1.2	1 75	0.60
16			3 00	6.6	2.31	4.4	1 67	1 3	1 78	1.0	1 74	0.60
17			3 33	10 0	2 00	2.4	1 87	2 2	1 79	1.1	1 73	0.60
18			3.33	11 0	2.30	4 5	1 89	2 3	1 79	1.1	1.72	0.60
19			3.00	9.3	2.00	2.4	1 97	2 7	1 97	1.9	1 60	0.20
20			2.90	8.3	2.00	2.5	2 30	5 1	1 87	1.4	1 55	0.18
21			2.90	8 3	2.30	4.7	2 34	5 4	1 89	1.5	1 50	0.15
22			2.70	6.6	2.20	4.0	2 33	5 2	1 40	0 1	1 60	0.20
23			2.80	7 4	2.30	4.8	2 34	5 2	1 37	0.1	1 65	0.40
24			2.80	7 4	2.30	4.9	2 35	5 3	1 37	0.1	1 65	0.40
25			2.90	8 3	2.20	4.2	2 37	5 4	1 30	0.0	1 68	0.40
26			3.00	9.2	2.10	3.5	2 35	5 2	1 25	0	1 70	0.50
27			3.20	11.0	2.05	3.2	2 20	4 0	1 20	0	1 69	0.50
28	4.5	18	2 95	8.8	2.03	3.2	2 18	3 8	1 10	0	1.70	0.50
29	4.5	18	2 92	8.5	2.02	3.1	2 10	3 1	0 90	0	1 69	0.50
30	4.5	18	2.30	2 5	2.00	3.0	2 20	3 8	0 90	0	1 68	0.40
31	4 6	19			1.99	3.0			0 95	0		

* Gauge height interpolated.
NOTE.—No observations of gauge height after September 1st.

MONTHLY DISCHARGE of Jones Coulee at Read's Ranche, Sask., for 1911.
(Drainage area, 45 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
March (28-31)	19.0	18.0	18.20	0.404	0.601	145
April	55.0	2.5	16.50	0.367	0.401	982
May	4.9	1.6	2.91	0.065	0.075	179
June	5.4	1.3	3.06	0 068	0.076	182
July	3.6	0.0	1.27	0.028	0.032	78
August	2.0	0.0	0.55	0.012	0.013	33
The period					1.198	1599

SWIFTCURRENT CREEK AT SINCLAIR'S RANCHE, SASK. (Upper Station)

This station was established June 15, 1910, by R. G. Swan. It is located on the S.E. ¼ Sec. 18, Tp. 10, Rge. 19, W. 3rd Mer., about 150 feet upstream from the mouth of Bone Creek, and about 1200 feet above the lower station,

The channel is straight for about 250 feet above and 150 feet blow the station. Both banks are fairiy high, and covered with a growth of brush. Neither bank will overflow. The bed of the stream is composed of sand, which will shift.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the right bank. The zero (elev., 87.91) is referred to a permanent iron bench-mark (assumed elev., 100.00) located 300 feet S 64.5° W of the gauge.

Discharge measurements are made at the station by wading. The initial point for soundings is a plug on the left bank about four inches above ground and 45 feet from the gauge. During high stages the gauge-heights at this station are affected by back-water from Bone Creek.

During 1911, the gauge was read by Geo. A. Mackintosh.

DISCHARGE MEASUREMENTS of Swiftcurrent Creek at Sinclair's Ranche (Upper Station), Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 15.....	G. H. Whyte.....				3.41	
May 9.....	do	11.2	7.25	1.320	0.90	9.570
June 7.....	do	8.8	4.58	0.926	0.64	4.165
July 8.....	do	9.0	4.75	0.692	0.69	3.290
July 29.....	do				0.31	0.181*
Aug. 30.....	do	5.5	1.22	0.639	0.41	0.780
Oct. 6.....	do	8.6	6.56	0.911	0.82	5.980

* Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek at Sinclair's Ranche (Upper Station), Sask., for 1911.

DAY.	April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.41		0.68	4.7
2.....			1.33		0.65	4.3
3.....			1.26		0.63	4.0
4.....			1.21		0.65	4.3
5.....			1.10		0.66	4.4
6.....			1.05		0.64	4.2
7.....			1.03		0.63	4.0
8.....			1.01		0.63	4.0
9.....	3.26	a	0.97	11.6	0.61	3.6
10.....	3.25		0.95	11.0	0.59	3.2
11.....	3.31		0.92	10.1	0.53	2.5
12.....	3.40		0.89	9.2	0.51	2.3
13.....	3.42		0.88	9.0	0.49	2.0
14.....	3.39		0.91	9.8	0.49	2.0
15.....	3.31		1.10	16.0	0.47	1.8
16.....	3.26		1.24	22.0	0.46	1.6
17.....	3.39		1.35	26.0	0.43	1.4
18.....	3.51		1.21	20.0	0.42	1.3
19.....	3.45		1.21	20.0	0.40	1.1
20.....	3.10		1.14	18.0	0.43	1.3
21.....	2.87		0.97	11.6	0.99	11.0
22.....	2.54		0.97	11.6	1.02	12.0
23.....	2.30		0.96	11.3	0.89	8.3
24.....	2.11		0.98	11.9	0.89	8.2
25.....	1.93		1.02	13.2	0.94	9.5
26.....	1.74		1.05	14.2	1.10	15.0
27.....	1.64		1.01	12.8	1.09	14.0
28.....	1.63		1.06	14.6	0.98	10.4
29.....	1.61		1.05	14.2	0.93	8.8
30.....	1.56		0.94	10.7	0.93	8.7
31.....			0.82	7.5		

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek at Sinclair's Ranche (Upper Station), Sask., for 1911.—Continued.

DAY.	July.		August.		September.		October.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1.08	14	0.34	0.4	0.38	0 6	0 68	3.2
2	1.11	14	0.33	0.3	0.35	0 4	0 69	3.3
3	1.08	13	0.31	0.2	0.34	0 4	0.78	4.7
4	1.08	13	0.32	0.3	0.68	3 2	0.84	5.9
5	0.93	8.2	0.45	1 0	1 10	13 0	0 83	5.7
6	0.84	6.0	0.57	2 0	1.98	48 0	0.82	5.5
7	0.83	5.7	0.59	2 1	2.11	53 0	0.82	5.5
8	0.80	5.1	0.65	2.8	2.36	63 0	0.80	5.1
9	0 85	6.1	0.65	2.8	2 10	53 0	0 78	4.7
10	0 70	3.4	0.61	2 3	1 97	48 0	0 75	4 2
11	0 67	3.0	0.80	5.1	1 65	35 0	0 74	4.0
12	0 61	2.3	0.74	4.0	1 01	10 0	0 71	3.6
13	0 60	2.2	0.63	2 6	0 73	3 9	0 67	3.0
14	0 58	2.0	0.56	1 9	0 70	3 4	0 64	2.7
15	0 51	1.5	0.56	1 9	0 69	3 3	0 62	2.4
16	0 49	1.3	0.53	1 6	0 67	3 0	0 62	2.4
17	0 48	1.2	0.51	1 5	0 65	2 8	0 62	2.4
18	0 45	1.0	0.46	1 1	0 65	2 8	0 64	2.7
19	0 46	1.1	0.43	0 9	0 64	2 7	0 69	3.3
20	0 46	1.1	0.41	0 8	0 64	2 7	0 73	3.9
21	0 45	1.0	0.43	0 9	0 64	2 7	0 73	3.9
22	0 44	0.9	0.45	1 0	0 66	2 9	0 71	3.6
23	0 46	1.1	0.44	0 9	0 70	3 4	0 73	3.9
24	0 45	1.0	0.43	0 9	0 72	3 7	0 79	4.9
25	0 44	0.9	0.44	0 9	0 71	3 6	0 81	5.3
26	0 44	0.9	0.46	1 1	0 70	3 4	0 89	7.1
27	0 40	0.7	0.45	1 0	0 70	3 4	0 95	8.6
28	0 35	0.4	0.44	0 9	0 69	3 3	1 01	10 0
29	0 31	0.2	0.43	0 9	0 69	3 3	1 05	12.0
30	0 32	0.3	0.42	0.8	0 68	3 2	1 07	12.0
31	0 35	0.4	0.40	0 7			1 09	13.0

a Backwater, making it impossible to obtain discharges from gauge heights from April 9 to May 8.

MONTHLY DISCHARGE of Swiftcurrent Creek at Sinclair's Ranche (Upper Station), Sask., for 1911.
(Drainage area, 171 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
May (9-31)	26.0	7.5	13.80	0.081	0.069	630
June	15.0	1.1	5.46	0.032	0.036	325
July	14.0	0.2	3.64	0.021	0.024	224
August	5.1	0.2	1 47	0.009	0.010	90
September	63.0	0.4	12.80	0.075	0.084	762
October	13.0	2.4	5.24	0.031	0.036	322
The period					.259	2353

BONE CREEK AT LEWIS' RANCHE, SASK.

This station was established July 2, 1908, by F. T. Fletcher. It is located at the bridge on the N.W. ¼ Sec. 34, Tp. 8, Rge. 22, W. 3rd Mer. It is on the surveyed trail from Skull Creek post office to East End post office, and is about fifteen miles south of Skull Creek post office by trail. The bridge is a small wooden structure, built in the form of a culvert, with a rectangular cross-section.

The channel is straight for 50 feet above the station, and below the station it curves gradually to the left after emerging from the downstream side of the bridge. The right bank is high

and will not overflow; the left bank is comparatively low, but no indication of the water overflowing the bank can be found. Both banks are free from brush at the station. The bed of the stream is sandy, with some large stones scattered along the cross-section. The current is moderate, becoming very swift below the station.

Discharge measurements are made from the upstream side of the bridge during high water. The initial point for soundings is the inner face of the left abutment. Low-water measurements are made near the station by wading.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to the left abutment on the up-stream side of the bridge. It is referred to bench marks as follows: — 1) the head of a spike surrounded by a circle of nail-heads in the top of the stringer on the left abutment at the upstream side of the bridge, marked "B.M." with white paint (elevation, 4.17 feet above the zero of the gauge); (2) the top of the iron pin in the road mound 754 feet north of the bridge on the left bank of the creek (elevation, 5.92 feet above the zero of the gauge).

During 1911, the gauge was read by C. L. Lewis.

DISCHARGE MEASUREMENTS of Bone Creek at Lewis' Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 10.....	G. H. Whyte.....	12.3	25.32	5.103	2.45	129.229
May 1.....	do.....	12.3	3.70	0.643	0.40	2.380
June 3.....	do.....	12.3	2.70	0.529	0.32	1.430
July 4.....	do.....	12.3	2.00	0.484	0.26	1.560
July 26.....	do.....	9.0	0.80	0.783	0.14	0.642*
Aug. 25.....	do.....	12.3	1.75	0.494	0.24	0.987*
Oct. 4.....	do.....	12.3	3.00	0.748	0.34	2.230

* Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Bone Creek at Lewis' Ranche, Sask., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0.86	18.0	0.39	2.5	0.30	1.6
2.....			1.00	26.0	0.38	2.4	0.30	1.6
3.....			1.09	31.0	0.37	2.3	0.32	1.8
4.....			1.09	31.0	0.37	2.3	0.31	1.7
5.....			1.09	31.0	0.37	2.3	0.48	4.1
6.....			1.09	31.0	0.37	2.3	0.31	1.7
7.....			0.70	10.4	0.38	2.4	0.31	1.7
8.....			0.36	2.2	0.32	1.8	0.32	1.8
9.....			2.18†	108.0	0.32	1.8	0.30	1.6
10.....			2.45	126.0	0.33	1.9	0.30	1.6
11.....			*1.15	36.0	0.33	1.9	0.30	1.6
12.....			1.09	31.0	0.33	1.9	0.29	1.5
13.....			1.09	31.0	0.32	1.8	0.28	1.5
14.....			1.09	31.0	0.51	4.7	0.27	1.4
15.....			0.50	4.4	0.52	4.9	0.26	1.3
16.....			1.25	42.0	0.60	7.0	0.25	1.3
17.....			0.95	23.0	0.45	3.6	0.23	1.1
18.....			0.59	6.7	0.44	3.4	0.22	1.0
19.....			0.70	10.4	0.44	3.4	0.50	4.4
20.....			0.75	13.0	0.40	2.7	0.45	3.5
21.....			0.50	4.4	0.34	2.0	0.40	2.7
22.....			0.49	4.2	0.34	2.0	0.35	2.1
23.....			0.48	4.1	0.32	1.8	0.30	1.6
24.....			0.45	3.6	0.32	1.8	0.30	1.6
25.....	1.10	32.0	0.47	3.9	0.32	1.8	0.40	2.7
26.....	0.70	10.4	0.41	2.9	0.32	1.8	0.38	2.4
27.....	0.80	15.0	0.41	2.9	0.32	1.8	0.34	2.0
28.....	0.60	7.0	0.42	3.0	0.33	1.9	0.32	1.8
29.....	1.15	36.0	0.42	3.0	0.34	2.0	0.33	1.9
30.....	0.69	10.1	0.51	4.7	0.34	2.0	0.34	2.0
31.....	0.59	6.7			0.33	1.9		

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Bone Creek at Lewis' Rancho, Sask., for 1911.—*Con.*

DAY.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.40	2.7	0.25	1.2	0.24	1.2	0.30	1.6	0.25	1.2
2.....	0.40	2.7	0.25	1.2	0.24	1.2	0.31	1.7	0.25	1.2
3.....	0.35	2.1	0.28	1.5	0.25	1.2	0.40	2.7	0.25	1.2
4.....	0.30	1.6	0.28	1.5	0.30	1.6	0.31	1.7	0.25	1.2
5.....	0.27	1.4	0.29	1.5	0.50	4.4	0.31	1.7	0.25	1.2
6.....	0.25	1.2	0.30	1.6	0.70	10.4	0.30	1.6	0.26	1.3
7.....	0.24	1.2	0.30	1.6	0.60	7.0	0.29	1.5	0.26	1.3
8.....	0.24	1.2	0.30	1.6	0.55	5.7	0.31	1.7	0.26	1.3
9.....	0.27	1.4	0.27	1.4	0.30	1.6	0.30	1.6	0.25	1.2
10.....	0.25	1.2	0.29	1.5	0.31	1.7	0.30	1.6	0.25	1.2
11.....	0.25	1.2	0.27	1.4	0.30	1.6	0.30	1.6	0.25	1.2
12.....	0.27	1.4	0.28	1.5	0.40	2.7	0.30	1.6	0.50	<i>a</i>
13.....	0.26	1.3	0.26	1.3	0.55	5.7	0.30	1.6	0.55	.....
14.....	0.25	1.2	0.22	1.0	0.26	1.3	0.30	1.6	0.65	.....
15.....	0.24	1.2	0.25	1.2	0.25	1.2	0.29	1.5	0.68	.....
16.....	0.25	1.2	0.26	1.3	0.25	1.2	0.30	1.6	.....	.....
17.....	0.25	1.2	0.25	1.2	0.33	1.9	0.31	1.7	.....	.....
18.....	0.25	1.2	0.19	0.8	0.30	1.6	0.32	1.8	.....	.....
19.....	0.25	1.2	0.19	0.8	0.30	1.6	0.30	1.6	.....	.....
20.....	0.26	1.3	0.20	0.9	0.30	1.6	0.30	1.6	.....	.....
21.....	0.25	1.2	0.21	1.0	0.32	1.8	0.30	1.6	.....	.....
22.....	0.24	1.2	0.22	1.0	0.35	2.1	0.30	1.6	.....	.....
23.....	0.25	1.2	0.22	1.0	0.36	2.2	0.27	1.4	.....	.....
24.....	0.25	1.2	0.26	1.3	0.35	2.1	0.25	1.2	.....	.....
25.....	0.24	1.2	0.25	1.2	0.33	1.9	0.25	1.2	.....	.....
26.....	0.20	0.9	0.27	1.4	0.33	1.9	0.27	1.4	.....	.....
27.....	0.20	0.9	0.25	1.2	0.31	1.7	0.30	1.6	.....	.....
28.....	0.20	0.9	0.26	1.3	0.32	1.8	0.27	1.4	.....	.....
29.....	0.20	0.9	0.26	1.3	0.31	1.7	0.25	1.2	.....	.....
30.....	0.25	1.2	0.25	1.2	0.31	1.7	0.25	1.2	.....	.....
31.....	0.24	1.2	0.24	1.2	.....	.....	0.25	1.2	.....	.....

a Stream frozen after this date.

† Water rose and ice went out.

* Ice all out.

MONTHLY DISCHARGE of Bone Creek at Lewis' Rancho, Sask., for 1911.

(Drainage area, 17 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
March (25-31).....	36.0	6.7	16.70	0.982	0.256	232
April.....	126.0	2.2	22.70	1.34	1.500	1351
May.....	7.0	1.8	2.54	0.149	0.172	156
June.....	4.4	1.0	1.95	0.115	0.125	116
July.....	2.7	0.9	1.29	0.076	0.088	79
August.....	1.6	0.8	1.26	0.074	0.085	77
September.....	10.4	1.2	2.51	0.148	0.165	149
October.....	2.7	1.2	1.57	0.092	0.106	96
November.....	1.3	1.2	1.23	0.072	0.029	27
The period.....	.....	.....	.....	.....	2.529	2283

SWIFTCURRENT CREEK AT SINCLAIR'S RANCHE (Lower Station) SASK.

This station was established on May 27, 1910, by H. R. Carscallen. It is located in the S.W. $\frac{1}{4}$ Sec. 17, Tp. 10, Rge. 19, W. 3rd Mer., at the highway bridge on the surveyed trail from East End to Gull Lake, and just below the mouth of Bone Creek.

The channel is straight for 75 feet above and 20 feet below the station. The left bank has a gradual slope, is high and well wooded. The right bank rises abruptly. It is also high and well wooded. The stream-bed is sandy in character, free from vegetation and liable to shift at high water. The current at this point is sluggish.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the inner face of the left abutment. Low-water measurements are made by wading, 100 feet upstream.

The gauge is of the standard chain type. The box is nailed securely to the down-stream side of the floor of the bridge. The length of chain from bottom of weight to marker is 21.2 feet. The zero (elev., 84.83) is referred to a permanent iron bench-mark (assumed elev., 100.00) located on the right bank 600 feet upstream from the bridge.

During 1911, the gauge was read by George A. Mackintosh.

DISCHARGE MEASUREMENTS of Swiftcurrent Creek at Sinclair's Ranche (Lower Station), Sask., in 1911.

Date.	Hydrographer.	Width	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 15.....	G. H. Whyte.....	22.0	70.90	1.690	5.43	120.05
May 9.....	do.....	28.0	28.84	1.179	3.53	33.95
June 7.....	do.....	17.0	28.15	0.827	3.32	23.28
July 8.....	do.....	16.0	24.30	0.630	3.22	15.37
July 29.....	do.....	17.1	6.57	0.685	2.57	4.50
Aug. 30.....	do.....		8.04	0.859	2.78	6.88
Oct. 6.....	do.....	17.0	25.39	1.114	3.47	28.33

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek at Sinclair's Ranche (Lower Station), Sask., for 1911.

DAY.	May.		June.		July		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			3.28	22.0	3.69	38.0	2.64	5.3	2.70	6.1	3.28	22.0
2.....			3.24	20.0	3.78	42.0	2.61	4.8	2.64	5.3	3.29	22.0
3.....			3.24	20.0	3.74	40.0	2.59	4.6	2.64	5.3	3.38	25.0
4.....			3.25	20.0	3.73	40.0	2.60	4.7	2.90	10.0	3.44	28.0
5.....			3.26	21.0	3.58	33.0	2.73	6.5	3.50	30.0	3.43	27.0
6.....			3.25	20.0	3.44	28.0	2.81	8.1	4.50	76.0	3.43	27.0
7.....			3.23	20.0	3.41	26.0	2.93	11.0	4.34	93.0	3.41	26.0
8.....			3.22	19.0	3.31	25.0	3.13	17.0	5.01	101.0	3.38	25.0
9.....			3.19	18.0	3.31	23.0	3.08	15.0	4.70	86.0	3.35	24.0
10.....			3.08	15.0	3.22	19.0	3.06	14.0	4.05	55.0	3.30	22.0
11.....			3.01	13.0	3.19	18.0	3.03	14.0	3.60	34.0	3.28	22.0
12.....	3.54	32.0	2.94	11.0	3.14	17.0	3.35	24.0	3.41	26.0	3.26	21.0
13.....	3.54	32.0	2.15	9.0	3.08	15.0	3.54	32.0	3.28	22.0	3.21	19.0
14.....	3.58	33.0	2.84	8.8	3.02	13.0	3.69	38.0	3.24	20.0	3.19	18.0
15.....	3.61	35.0	2.83	8.6	2.94	11.0	3.70	39.0	3.20	19.0	3.17	18.0
16.....	3.89	47.0	2.80	7.9	2.86	9.2	3.59	34.0	3.19	18.0	3.16	17.0
17.....	4.04	54.0	2.76	7.2	2.90	10.0	2.97	12.0	3.19	18.0	3.16	17.0
18.....	3.98	51.0	2.74	6.8	2.95	11.0	2.68	5.8	3.21	19.0	3.19	18.0
19.....	3.94	50.0	2.73	6.6	2.98	12.0	2.61	4.8	3.21	19.0	3.26	21.0
20.....	3.75	41.0	2.84	8.8	2.96	12.0	2.54	4.0	3.20	19.0	3.34	24.0
21.....	3.60	34.0	3.84	45.0	2.95	11.0	2.65	5.4	3.21	19.0	3.33	23.0
22.....	3.59	34.0	3.74	40.0	2.95	11.0	2.76	7.2	3.25	20.0	3.33	23.0
23.....	3.58	33.0	3.72	40.0	2.98	12.0	2.75	7.0	3.33	23.0	3.33	23.0
24.....	3.63	36.0	3.68	38.0	2.97	12.0	2.75	7.0	3.33	23.0	3.34	24.0
25.....	3.68	38.0	3.70	39.0	2.72	6.5	2.79	7.7	3.32	23.0	3.40	26.0
26.....	3.71	39.0	3.76	41.0	2.71	6.3	2.84	8.8	3.31	23.0	3.51	31.0
27.....	3.69	38.0	3.74	40.0	2.68	5.8	2.80	7.9	3.30	22.0	3.60	34.0
28.....	3.70	39.0	3.54	32.0	2.63	5.1	2.79	7.7	3.29	22.0	3.71	39.0
29.....	3.68	38.0	3.48	29.0	2.57	4.3	2.77	7.3	3.29	22.0	3.77	42.0
30.....	3.50	30.0	3.47	29.0	2.58	4.5	2.77	7.3	3.28	22.0	3.79	43.0
31.....	3.35	24.0			2.64	5.3	2.75	7.0			3.82	44.0

SESSIONAL PAPER No. 25d

MONTHLY DISCHARGE of Swiftcurrent Creek at Sinclair's Rancho Lower Station¹, Sask., for 1911.
(Drainage area, 365 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
May (12-31).....	54.0	24.0	37.9	0.104	0.077	1503
June	45.0	6.6	21.9	0.060	0.067	1303
July	42.0	4.3	17.0	0.047	0.054	1 45
August	39.0	4.0	12.2	0.033	0.038	750
September	101.0	5.3	30.5	0.082	0.091	1785
October.....	44.0	17.0	25.6	0.07	0.081	1574
The period.....					.408	7460

SWIFTCURRENT CREEK AT SWIFT CURRENT, SASK.

This station was established April 30, 1910, by H. R. Carscallen. It is located at the traffic bridge on the north side of the C.P.R. tracks in the town of Swift Current on S.W. ¼ Sec. 30, Tp. 15, Rge. 13, W. 3rd Mer.

The channel curves slightly, but is almost straight for about 300 feet above the station and is straight for about 300 feet below. The right bank is rather low with a gradual slope; the left bank is high. Both banks are clear of brush and undergrowth, and are not liable to overflow. The bed of the stream is sandy, with a few large stones, and is liable to shift at high stages. Weeds in the cross-section make it difficult to make discharge measurements during low stages of the stream, when the current is sluggish.

During ordinary stages, discharge measurements are made from the downstream side of the bridge, but at low stages they are made by wading near the bridge. The initial point for soundings is the inner face of the row of piles at end of the south approach.

The gauge is a plain staff graduated to feet and hundredths, spiked vertically to the inside face of the left abutment of the bridge. The zero of the gauge (elev., 85.71) is referred to a permanent iron bench-mark (assumed elev., 100.00) situated eight feet east of the south approach of the bridge.

The survey did not obtain sufficient data during 1910, to plot a gauge-height discharge curve, and the records for 1910 are therefore published in this report.

During 1910 and 1911, the gauge was read by C. E. Wesley, who lives within 200 yards of the bridge.

DISCHARGE MEASUREMENTS of Swiftcurrent Creek at Swift Current, Sask., in 1910-11.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1910						
April 30.....	H. R. Carscallen.	67 8	73 84	0 581	1 600	42 92
May 25.....	P. M. Sauder.....	43 5	34 29	0 502	1 600	32 99*
June 6.....	G. H. Whyte.....	42 0	30 91	0 774	1 500	23 93*
June 23.....	R. G. Swan.....	42 0	29 88	0 726	1 600	21 69*
July 21.....	do	38 0	23 43	0 260	1 390	6 10*
Aug. 11.....	do	39 0	23 02	0 318	1 460	7 32*
Sept. 1....	do	39 0	24 37	0 400	1 400	9 74*
Oct. 1....	do	41 0	29 65	0 548	1 380	16 27*
Oct. 29.....	do	42 0	32 16	0 731	1 470	23 51*
1911.						
Mar. 27.	G. H. Whyte.	85 0	263 50	2 115	6 420	557 36†
April 25.....	W. H. Greene .	74 1	123 18	1 520	2 340	187 18
May 4	J. C. Keith. . .	71 5	89 92	1 090	1 870	97 48
May 22	do	70 5	74 93	0 840	1 700	63 33
June 6	do	70 0	76 98	0 700	1 740	53 80
July 4	do	71 0	81 47	0 610	1 825	50 09
Sept. 5	do	29 0	17 12	1 000	1 430	18 23*
Oct. 25	do	70 0	40 0	0 400	1 290	15 90

* Measurement made upstream from regular station.
† Ice in stream.

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek at Swift Current, Sask., for 1910.

DAY.	May		June.		July.		August.		September.		October.	
	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1 60	44	1 50	23	1 50	14	1 25	0	1 40	10	1 35	14
2	1 57	40	1 50	23	1 45	9	1 25	0	1 50	20	1 35	14
3	1 57	40	1 55	28	1 60	24	1 25	0	1 45	15	1 40	19
4	1 55	36	1 55	28	1 50	14	1 20	0	1 50	20	1 35	14
5	1 55	36	1 60	34	1 55	19	1 20	0	1 50	20	1 35	14
6	1 55	36	1 50	24	1 50	14	1 30	0	1 55	28	1 35	14
7	1 55	35	1 50	23	1 70	36	1 40	4	1 60	33	1 35	14
8	1 55	35	1 50	22	1 60	25	1 40	4	1 60	33	1 35	14
9	1 55	34	1 50	22	1 55	20	1 50	13	1 55	28	1 35	14
10	1 55	34	1 55	26	1 50	24	1 50	13	1 55	28	1 35	14
11	1 55	34	1 50	20	1 65	32	1 50	13	1 55	28	1 35	14
12	1 55	33	1 50	19	1 55	21	1 50	13	1 55	29	1 35	14
13	1 55	32	1 45	13	1 65	32	1 40	3	1 55	29	1 35	14
14	1 55	32	1 45	12	1 60	18	1 35	1	1 55	30	1 35	14
15	1 60	38	1 55	22	1 55	22	1 40	4	1 50	24	1 35	14
16	1 60	37	1 50	17	1 55	22	1 40	4	1 45	20	1 35	13
17	1 70	48	1 60	26	1 50	18	1 55	20	1 42	17	1 35	13
18	1 60	36	1 70	36	1 50	18	1 50	16	1 40	15	1 35	13
19	1 65	42	1 60	24	1 45	12	1 45	11	1 40	16	1 35	13
20	1 75	54	1 65	29	1 45	12	1 40	7	1 35	11	1 35	13
21	1 90	76	1 60	23	1 40	8	1 40	8	1 35	11	1 35	12
22	1 70	46	1 60	23	1 35	4	1 40	8	1 30	8	1 35	12
23	1 70	46	1 55	17	1 40	8	1 35	3	1 30	8	1 35	12
24	1 65	40	1 60	22	1 40	7	1 50	18	1 30	8	1 35	12
25	1 60	32	1 55	17	1 40	7	1 55	23	1 35	12	1 35	12
26	1 55	28	1 55	17	1 45	11	1 50	19	1 30	8	1 35	12
27	1 55	28	1 50	13	1 40	7	1 50	19	1 30	8	1 35	11
28	1 55	28	1 50	13	1 35	2	1 45	14	1 30	8	1 55	34
29	1 55	28	1 50	13	1 35	2	1 40	9	1 30	8	1 40	18
30	1 55	28	1 50	14	1 35	2	1 40	9	1 35	14	1 40	18
31	1 55	28			1 30	0.0	1 40	9			1 40	17

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek at Swift Current, Sask., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge charge	Dis-Height.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			4.8	360	2.0	117	1.7	53
2			5.0	460	2.0	117	1.7	52
3			5.0	505	1.9	99	1.7	52
4			5.1	580	1.9	99	1.6	38
5			5.1	625	1.9	99	1.7	50
6			5.1	675	1.9	99	1.7	49
7			5.1	725	1.8	82	1.7	48
8			4.5	608	1.8	82	1.7	47
9			4.1	548	1.7	66	1.7	46
10			3.9	518	1.7	66	1.7	46
11			4.2	672	1.7	66	1.7	45
12			4.4	728	1.7	66	1.6	32
13			5.0	896	1.7	66	1.6	31
14			4.8	840	1.7	66	1.6	30
15			3.8	562	1.7	66	1.6	30
16			3.1	376	1.7	66	1.6	29
17			3.0	350	1.7	66	1.5	18
18			3.0	350	1.7	66	1.5	18
19			2.8	298	1.7	66	1.4	7
20			2.7	272	1.8	82	1.4	7
21			2.7	272	1.8	82	1.5	16
22			2.6	248	1.8	82	1.5	16
23			2.5	224	1.8	78	1.6	26
24			2.4	200	1.7	61	1.6	25
25			2.3	178	1.7	60	1.9	64
26			2.1	136	1.7	59	2.0	79
27	6.42	558	2.2	157	1.7	58	1.9	62
28	6.40	600	2.2	157	1.8	71	1.9	62
29	6.10	568	2.1	136	1.8	70	1.9	61
30	5.30	400	2.1	136	1.8	69	1.9	61
31	5.00	365			1.8	68		

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek at Swift Current, Sask., for 1911.—
Continued.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1..	1 9	61	1 3	3	1 4	14	1 6	44
2..	1 9	60	1 3	4	1 4	14	1 5	32
3.....	1 9	60	1 3	4	1 4	14	1 6	45
4...	1 8	47	1 3	4	1 4	14	1 6	45
5..	1 9	60	1 3	4	1 4	15	1 6	46
6..	1 8	48	1 3	4	1 4	15	1 5	34
7...	1 9	62	1 4	11	1 6	38	1 5	34
8..	1 8	48	1 6	32	1 6	38	1 5	34
9..	1 8	49	1 6	32	1 7	52	1 5	35
10..	1 8	50	1 6	32	2 1	116	1 5	35
11..	1 7	38	1 5	22	2 2	136	1 5	36
12.....	1 7	38	1 5	22	2 2	137	1 5	36
13...	1 6	26	1 5	22	2 1	118	1 5	36
14..	1 5	16	1 5	22	1 9	82	1 4	25
15..	1 5	16	1 6	34	1 8	68	1 4	25
16...	1 4	7	1 5	23	1 7	54	1 4	25
17...	1 5	17	1 5	23	1 7	54	1 4	26
18.....	1 5	17	1 5	23	1 6	40	1 4	26
19.....	1 5	18	1 5	23	1 6	40	1 5	38
20.....	1 5	18	1 4	13	1 5	29	1 5	38
21.....	1 5	18	1 4	13	1 5	29	1 5	39
22.....	1 4	8	1 4	13	1 6	42	1 4	27
23.....	1 5	18	1 4	13	1 6	42	1 4	27
24..	1 5	18	1 4	13	1 6	42	1 5	39
25...	1 4	9	1 4	14	1 6	43	1 4	28
26..	1 4	9	1 5	24	1 5	31	1 3	17
27.....	1 4	9	1 4	14	1 5	31	1 3	17
28.....	1 4	9	1 4	14	1 5	31	1 3	17
29..	1 3	3	1 4	14	1 6	44	1 4	28
30.....	1 3	3	1 4	14	1 6	44	1 4	28
31...	1 3	3	1 4	14	...	...	1 4	28

MONTHLY DISCHARGE of Swiftcurrent Creek at Swift Current, Sask., for 1910-11.
(Drainage area, 1015 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
1910						
May	76	28.0	37.50	0.037	0.043	2306
June..	36	12.0	21.40	0.021	0.023	1273
July.....	36	0.0	15.00	0.015	0.017	922
August	23	0.0	8.55	0.008	0.009	526
September	33	8.0	18.20	0.018	0.020	1083
October	34	11.0	14.50	0.014	0.016	892
The period					.128	7002
1911						
March (27-31).....	600	365	498.0	0.491	0.091	4939
April	896	136	427.0	0.421	0.470	25408
May	117	58	76.1	0.075	0.086	4679
June	79	7	40.0	0.039	0.044	2380
July.....	62	3	27.8	0.027	0.031	1709
August	34	3	16.7	0.016	0.018	1027
September	137	14	48.9	0.048	0.054	2910
October	46	17	31.9	0.031	0.036	1962
The period					.830	45014

SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS of Swiftcurrent Creek Drainage Basin, in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. Feet.</i>	<i>Feet per Sec.</i>	<i>Sec.-Ft.</i>
Aug. 7.....	G. R. Elliott....	A Coulee.....	Sec. 21-7-21-3				1.153 *
Aug. 12.....	do	do	do				Nil
Aug. 12.....	do	do	Sec. 8-7-21-3				Nil.
Aug. 1.....	F. T. Fletcher..	Spring Creek....	N.W. 34-8-22-3.				0.411 *
Aug. 1.....	do	do	N.E. 33-8-22-3.				0.575 *

* Weir measurement.

ANTELOPE LAKE DRAINAGE BASIN.

General Description.

Antelope Lake is a small body of saline water, six miles long, and from one to one and a half miles wide, at an elevation of 2300 feet above sea-level. It lies in a deep depression north of the main line of the Canadian Pacific Railway, in Tp. 15, Rge. 18, W. 3rd Mer., and drains an area of about 350 square miles.

The lake receives its supply from Bridge Creek, which rises in the Cypress Hills. The altitude of the source of this creek is 2800 feet and it has an average fall of 15 feet per mile.

The valley traversed by Bridge Creek is narrow and quite shallow, rarely exceeding 100 feet in depth. The land lying along the creek bottom is very flat and liable to become inundated during periods of flood. The bench-land is rolling prairie, cut up by innumerable coulees which drain the surrounding country into the main valley.

The mean annual rainfall amounts to about 14 inches, most of which occurs during May, June and July. The creek has only a small flow, and is dry along most of its course for several months during the year.

A number of irrigation schemes receive their supply from this basin. The largest of these are Moorhead and Fearon's works, which divert water from Bridge Creek in Sec. 33, Tp. 10, Rge. 22, W. 3rd Mer.

BRIDGE CREEK NEAR DOYLE'S RANCHE, SASK.

This station was established April 8, 1911, by G. H. Whyte, to obtain the discharge of Bridge Creek above Fearon and Moorhead's irrigation ditch. It is located on S.E. ¼ Sec. 33, Tp. 10, Rge. 22, W. 3rd Mer., and about 400 yards upstream from the head-gate of the ditch and some two miles from Skull Creek post office.

The channel is straight for about 30 feet above and below the station. The right bank is low and covered with small shrubs, while the left is high and clear of tree growth. The bed of the stream is sandy and shifts. The current is moderate at all stages.

The gauge, which is read by Thos. Doyle, is a plain staff graduated to feet and hundredths, placed at the left side of the channel and referred to bench marks as follows:— 1. a spike in the top of the initial-point stake driven close to the ground on the left bank (elevation 8.26 above zero of the gauge); 2. a spike on the top of a plug driven close to the ground, 55 feet N 62° W of the rod (elevation 7.94 above the zero of the gauge).

Discharge measurements are made at the gauge by wading or during high stages at the government bridge three miles below. During most of the season, however, measurements are made with a weir at or near the gauge. The initial point for sounding is a plug driven close to the ground on the left bank, and a tagged wire is strung across the stream to mark the regular section.

DISCHARGE MEASUREMENTS of Bridge Creek near Doyle's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 8	G. H. Whyte.	3.2	2.27	1.471	1.89	3.3400†
April 29	do	6.9	4.33	0.323	0.94	1.4000*
June 2	do				0.71	0.3120*
June 29	do				0.70	0.2385*
July 6	G. R. Elliott.					0.3280*
July 21	G. H. Whyte.				0.67	0.2350*
Aug. 24	do				0.66	0.1750*
Sept. 30	do				0.74	0.3440*

† Ice in stream.
* Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Bridge Creek near Doyle's Ranche, Sask., for 1911.

DAY.	April.		May.		June.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			1.00	1.80	0.75	0.41
2			0.95	1.40	0.75	0.41
3			0.85	0.84	0.75	0.41
4			0.80	0.58	0.75	0.41
5			0.75	0.41	0.78	0.51
6			0.75	0.41	0.75	0.41
7			0.80	0.58	0.75	0.41
8			0.75	0.41	0.74	0.38
9			0.75	0.41	0.73	0.34
10			0.75	0.41	0.70	0.24
11			0.80	0.58	0.70	0.24
12			0.75	0.41	0.70	0.24
13			0.75	0.41	0.67	0.19
14			0.80	0.58	0.67	0.19
15			0.75	0.41	0.64	0.14
16			0.80	0.58	0.64	0.14
17			0.80	0.58	0.62	0.11
18			0.78	0.51	0.62	0.11
19			0.75	0.41	0.62	0.11
20			0.75	0.41	0.75	0.41
21			0.75	0.41	0.80	0.58
22			0.75	0.41	0.78	0.51
23			0.94	1.40	0.76	0.44
24			0.90	1.10	0.75	0.41
25			0.85	0.84	0.80	0.58
26			0.85	0.84	0.80	0.58
27			0.85	0.84	0.72	0.31
28			0.84	0.79	0.70	0.24
29	0.95	1.4	0.80	0.58	0.70	0.24
30	0.90	1.1	0.80	0.58	0.95	1.40
31			0.75	0.41		

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Bridge Creek near Doyle's Ranche, Sask., for 1911.—
Continued.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0 80	0 58	0 59	0 07	0 65	0 16	0 75	0 41
2	0 95	1 4	0 58	0 07	0 65	0 16	0 75	0 41
3	0 85	0 84	0 58	0 07	0 65	0 16	0 78	0 51
4	0 85	0 84	0 60	0 08	0 75	0 41	0 75	0 41
5	0 85	0 84	0 65	0 16	0 75	0 41	0 75	0 41
6	0 80	0 58	0 65	0 16	0 95	1 4	0 75	0 41
7	0 78	0 51	0 80	0 58	0 95	1 4	0 75	0 41
8	0 75	0 41	0 80	0 58	0 85	0 84	0 75	0 41
9	0 75	0 41	0 85	0 84	0 80	0 58	0 75	0 41
10	0 75	0 41	0 82	0 68	0 75	0 41	0 75	0 41
11	0 72	0 31	0 80	0 58	0 75	0 41	0 75	0 41
12	0 72	0 31	0 75	0 41	0 75	0 41	0 75	0 41
13	0 72	0 31	0 75	0 41	0 75	0 41	0 75	0 41
14	0 70	0 24	0 70	0 24	0 75	0 41	0 75	0 41
15	0 67	0 19	0 70	0 24	0 75	0 41	0 75	0 41
16	0 65	0 16	0 65	0 16	0 75	0 41	0 75	0 41
17	0 70	0 24	0 65	0 16	0 75	0 41	0 75	0 41
18	0 70	0 24	0 65	0 16	0 75	0 41	0 75	0 41
19	0 67	0 19	0 60	0 08	0 73	0 34	0 76	0 44
20	0 65	0 16	0 62	0 11	0 73	0 34	0 76	0 44
21	0 64	0 14	0 63	0 13	0 75	0 41	0 75	0 41
22	0 62	0 11	0 65	0 16	0 75	0 41	0 76	0 44
23	0 62	0 11	0 65	0 16	0 75	0 41	0 76	0 44
24	0 62	0 11	0 66	0 18	0 75	0 41	0 76	0 44
25	0 62	0 11	0 66	0 18	0 75	0 41		
26	0 60	0 08	0 66	0 18	0 75	0 41		
27	0 60	0 08	0 67	0 19	0 75	0 41		
28	0 60	0 08	0 67	0 19	0 70	0 24		
29	0 60	0 08	0 66	0 18	0 70	0 24		
30	0 60	0 08	0 67	0 19	0 75	0 41		
31	0 60	0 08	0 66	0 18				

MONTHLY DISCHARGE of Bridge Creek near Doyle's Ranche, Sask., for 1911.
(Drainage area, 6 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
April (29-30)	1.40	1.10	1.250	0.208	0.016	5
May	1.80	0.41	0.658	0.109	0.126	40
June	1.40	0.11	0.370	0.062	0.069	22
July	1.40	0.08	0.330	0 055	0.063	20
August	0.84	0.07	0.250	0.042	0.048	15
September	1.40	0.16	0.455	0.076	0 085	27
October (1-24)	0.51	0.41	0.420	0.070	0.062	20
The period					.469	149

FEARON AND MOORHEAD BRIDGE CREEK DITCH NEAR SKULL CREEK, SASK.

This station was established July 6, 1911, by G. R. Elliott, on Messrs. Fearon and Moorhead's irrigation ditch, which diverts water from Bridge Creek on the S.E. ¼ Sec. 33, Tp. 10, Rge. 22, W. 3rd Mer.

The gauge is located on S.E. ¼ Sec. 33, and is about 25 feet from the intake. It is a plain staff graduated into feet and inches, and is on the left bank of the ditch. The zero elev., 95.37) is referred to a small nail on the left side of the head-gate marked "B.M." (assumed elev., 100.00).

The station is at a uniform cross-section of the ditch, which is three feet wide at the bottom with side slopes of two to one.

As the rod was established late in the season, no records of the flow were obtained. Considerable water was diverted through this ditch earlier in the season.

BRIDGE CREEK NEAR SKULL CREEK, SASK.

This station was established July 29, 1909, by H. R. Carscallen. It is located at the highway bridge on the surveyed trail running eastward from Maple Creek on the N.E. ¼ Sec. 11, Tp. 11, Rge. 22, W. 3rd Mer. It is about four miles from Skull Creek Post Office and 27 miles from Maple Creek.

The channel is straight for 100 feet above and 30 feet below the station. Both banks are high and not liable to overflow. The stream is entirely devoid of tree growth. The bed of the creek is composed of clay, and may shift somewhat at high stages. There is a small amount of vegetation at the station. The current is sluggish.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to the centre pile on the downstream side of the bridge. It is referred to bench marks as follows:— (1) the head of a spike surrounded by a circle of nail-heads in the top of the stringer at the right or east abutment on the downstream side of the bridge (elevation, 9.83 feet above gauge zero); (2) the head of a spike in the top of a pointed six-inch wooden post firmly sunk into the ground on the left bank about 60 feet northwest of the gauge, the post blazed and marked "B.M." (elevation, 6.26 feet above gauge zero).

During high water, discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the inner face of the left, or west abutment. Low-water measurements are made near the bridge by wading, and at very low stages a weir is used.

During 1911, the gauge was read by James Mann.

DISCHARGE MEASUREMENTS of Bridge Creek near Skull Creek, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 8.....	G. H. Whyte.	.....	.....	.....	.....	Nil. †
June 2.....	do .....	.....	.....	.....	0.99	0.022‡
Sept. 30.....	do .....	.....	.....	.....	1.08	0 145‡

† Creek was full of snow.
‡ Weir measurements.

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Bridge Creek near Skull Creek, Sask., for 1911.

DAY.	April.		May.		June.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	a		1.68	1 30	1 12	0.13
2	a		1 54	1 00	0 97	0.03
3	a		1 57	0 95	0 97	0.03
4	a		1 39	0 52	*1 00	0.04
5 .....	.. a		1 43	0 61	1 01	0.05
6	a		1 21	0 22	1 04	0.07
7	a		*1 14	0 15	1 08	0.10
8 .....	.. a		1 04	0 07	1 09	0 10
9	a		1 01	0 05	1 11	0.12
10	a		1 00	0 04	0 87	Nil
11	a		1 01	0 05	* 50	..
12	a		1 15	0 16	0 78	..
13	1.86	1.90	1 17	0 18	0 77	..
14	1.90	2.10	1 23	0 26	0 75	..
15	2.15	3.20	1 36	0 47	Dr.	..
16	2.12	3 00	1 25	0 28	..	..
17	2.05	2.70	1 35	0 45	..	..
18	1.96	2.30	1 25	0 28	..	..
19	1.94	2.30	1 16	0 17	..	..
20	1.90	2.10	1 16	0 17	..	..
21	1.63	1.10	1 16	0 17	..	..
22	1.62	1.10	1 20	0 21	..	..
23	1.58	0 98	1 24	0 27	1 00	0.04
24	1.61	1.10	*1 27	0 32	1 10	0.11
25	1.63	1.10	1 30	0 36	1 12	0.13
26	1 09	1.30	1 38	0 50	1 13	0 14
27	*1 54	1.87	1 48	0 72	1 10	0.11
28	1 37	1.49	*1 44	0 63	1 06	0 08
29	1 11	1.12	1 39	0 52	1 11	0.12
30	1 40	1.54	1 35	0 45	1 17	0.18
31			1 24	0 27		..

DAILY GAUGE HEIGHT AND DISCHARGE of Bridge Creek near Skull Creek, Sask., for 1911.—*Con.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1 12	0.13	Dry.	Nil.	Dry.	Nil.	* 1 15	0 16
2.....	0 97	0.03	"	"	"	"	1 21	0.22
3.....	1 06	1 20	"	"	"	"	1 26	0.30
4.....	1 51	0.87	"	"	"	"	1 32	0.40
5.....	1 48	0.72	"	"	"	"	1 33	0.41
6.....	1 41	0.56	"	"	"	"	1 33	0.41
7.....	1 18	0.19	"	"	1 30	0 36	1 35	0 45
8.....	1 21	0.22	"	"	1 90	2 10	* 1 30	0.36
9.....	* 1 23	0.26	"	"	1 89	2 10	1 25	0.28
10.....	1 26	0.30	"	"	* 1 82	1 80	1 21	0.22
11.....	1 14	0.15	"	"	1 76	1 60	1 17	0.18
12.....	1 00	0.04	"	"	1 78	1 60	1 14	0.15
13.....	0 98	0.03	"	"	1 09	0 10	1 14	0.15
14.....	0 96	0.02	"	"	1 52	0 81	1 15	0.16
15.....	0 94	0.02	"	"	1 47	0 69	1 18	0.19
16.....	0 82	Nil.	"	"	1 40	0 54	1 21	0.22
17.....	0 78	"	"	"	* 1 50	0 76	1 22	0 24
18.....	Dry.	"	"	"	1 58	0 98	1 24	0.27
19.....	"	"	"	"	1 55	0 90	1 25	0 28
20.....	"	"	"	"	1 53	0 84	1 26	0.30
21.....	"	"	"	"	1 58	0 98	1 27	0.32
22.....	"	"	"	"	1 87	2 00	1 28	0.33
23.....	"	"	"	"	1 49	0 74	1 30	0.36
24.....	"	"	"	"	1 35	0 45	1 30	0.36
25.....	"	"	"	"	1 31	0 38	1 32	0 40
26.....	"	"	"	"	1 28	0 33	1 34	0.43
27.....	"	"	"	"	1 26	0 30	1 36	0.47
28.....	"	"	"	"	1 26	0 30	1 37	0.49
29.....	"	"	"	"	1 29	0 34	1.38	0.50
30.....	"	"	"	"	1 08	0 10	.....	a
31.....	"	"	"	"	.....	.....	.....	a

a Stream frozen.
* Gauge height interpolated.

MONTHLY DISCHARGE of Bridge Creek near Skull Creek, Sask., for 1911.
(Drainage area, 15 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
April (13-30).....	3.20	0.12	1.57	0 105	0.070	56
May.....	1.30	0 04	0 381	0.025	0.029	23
June.....	0.18	0.00	0.053	0.004	0.004	3
July.....	1.20	0.00	0.153	0.010	0.012	9
August.....	0.00	0.00	0.00			0
September.....	2.10	0.00	0.703	0.047	0.052	42
October (1-29).....	0.50	0.15	0.311	0.021	0.023	18
The period.....					.190	151

BRIDGE CREEK AT GULL LAKE, SASK.

This station was established March 29, 1911, by G. H. Whyte, on the highway bridge near the Canadian Pacific Railway station on S. E. ¼ Sec. 23, Tp. 13, Rge. 19, W. 3rd Mer.
The channel is slightly curved for 160 feet above, but is straight for 80 feet below. Both banks are low and liable to overflow. The bed of the stream is sandy and liable to shift.

SESSIONAL PAPER No. 25d

Discharge measurements are made from the bridge at high stages or by wading near the section. At low stages a weir may be used. The initial point for sounding is on the left-hand downstream side of the bridge and is marked with a broad arrow.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the downstream side of the right abutment. The zero (elev., 95.775) is referred to a permanent iron bench-mark (assumed elev., 100.00), located on the right bank 182 feet from the gauge and 158 feet from the northwest corner of the Canadian Pacific Railway station.

The gauge was read by J. D. Lloyd and J. B. Scott.

DISCHARGE MEASUREMENTS of Bridge Creek at Gull Lake, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 29.....	G. H. Whyte.....	22.0	5.54	0.713	0.895	3.950
May 5.....	J. C. Keith.....	4.0	1.10	0.735	0.525	0.800
May 8.....	G. H. Whyte.....	5.1	2.74	0.722	0.670	1.978
May 23.....	J. C. Keith.....					Nil.
June 9.....	do					Nil.
July 5.....	do					Nil.
Sept. 5.....	do					Nil.
Oct. 26.....	do					Nil.

DAILY GAUGE HEIGHT AND DISCHARGE of Bridge Creek at Gull Lake, Sask., for 1911.

DAY.	March.		April		May.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0.90	4.0	0.59	1.30
2.....			0.90	4.0	0.59	1.30
3.....			0.90	4.0	0.59	1.30
4.....			0.90	4.0	0.58	1.20
5.....			0.90	4.0	0.56	1.10
6.....			0.90	4.0	0.56	1.10
7.....			0.90	4.0	0.55	1.00
8.....			0.90	4.0	0.52	0.77
9.....			1.10	6.0	0.48	0.48
10.....			1.90	14.0	0.42	0.10
11.....			1.70	12.0	0.38	0.0
12.....			1.30	8.0	0.38	0.0
13.....			0.80	3.1	0.39	0.0
14.....			0.70	2.2	0.39	0.0
15.....			0.90	4.0	0.39	0.0
16.....				a		
17.....					0.38	0.0
18.....					0.38	0.0
19.....					0.36	0.0
20.....						b
21.....						
22.....						
23.....			0.63	1.6		
24.....			0.59	1.3		
25.....			0.59	1.3		
26.....			0.59	1.3		
27.....			0.58	1.2		
28.....			0.62	1.6		
29.....	0.9	4.0	0.69	2.1		
30.....	0.9	4.0		a		
31.....	0.9	4.0				

a No observations April 16 to 22 and 30.

b Dry to end of season.

MONTHLY DISCHARGE of Bridge Creek at Gull Lake, Sask., for 1911.
(Drainage area, 213 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
March (29-31).....	4.0	4.0	4.000	0.019	0.002	24
April (1-15, 23-29).....	14.0	1.3	4.170	0.020	0.016	18
May (1-18).....	1.3	0.0	0.311	0.001	0.001	19
The period.....					.019	61

LAKE OF THE NARROWS DRAINAGE BASIN.

General Description.

Lake of the Narrows is a small lake, three miles long and one and a half miles wide, in Township 3, Range 23, west of the 3rd Meridian. It has a drainage area of about 200 square miles. The principal stream in the basin is Skull Creek, which rises in the eastern slope of Cypress Hills. It flows through a narrow valley for the greater part of its course, but as it nears the lake, the valley widens out into large meadows. The surrounding country is rolling prairie. In very dry years such as 1910, Skull Creek goes dry for a short time. The mean annual precipitation in the drainage basin is about 13 inches. There are several small irrigation ditches in this drainage basin, the largest of which is Moorhead and Fearon's ditch, which diverts water from Skull Creek on the N.E. ¼ Sec. 29, Tp. 10, Rge. 22, W. 3rd Mer.

SKULL CREEK AT DOYLE'S RANCHE.

This station was established April 8, 1911, by G. H. Whyte, to obtain the discharge of the stream above all ditches. It is located on the N.E. ¼ Sec. 29, Tp. 10, Rge. 22, W. 3rd Mer., about one-quarter of a mile above the head-gate of Fearon and Moorhead's irrigation ditch, one and a half miles above Skull Creek post office, and half a mile upstream from Thos. Doyle's house. The channel is straight for about twenty feet above and below the station. The right bank is high, while the left is low and liable to overflow during high-water stages. Both banks are well wooded. The bed is composed of sand and gravel, which may shift during high water. The current is fairly swift. The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the right bank. The zero (elev., 87.20) is referred to a permanent iron bench-mark (assumed elev., 100.00), located 350 feet N 32° E of the gauge. Discharge measurements are made at low and ordinary stages by wading or with a weir. At high stages, measurements are made from the traffic bridge at the lower station, which is three miles downstream. The gauge was read by Mr. Thomas Doyle.

DISCHARGE MEASUREMENTS of Skull Creek at Doyle's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
April 9.....	G. H. Whyte.....	15.4	18.18	2.788	1.965	50.700
April 29.....	do.....	15.4	10.31	0.869	0.980	8.960
June 2.....	do.....	8.9	5.08	0.594	0.740	3.020
June 29.....	do.....	11.0	3.47	0.562	0.750	1.95
July 21.....	do.....				0.700	0.985
July 25.....	do.....				0.650	0.736
Aug. 24.....	do.....				0.730	0.837
Oct. 1.....	do.....	10.0	3.27	0.633	0.780	2.070

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Skull Creek at Doyle's Ranche, Sask., for 1911.

Day.	April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			0.95	8.0	0.75	3.3
2.....			0.90	6.3	0.75	3.3
3.....			0.85	4.8	0.75	3.3
4.....			0.85	4.9	0.75	3.2
5.....			0.85	5.0	0.80	4.5
6.....			0.80	3.6	0.75	3.1
7.....			0.85	5.1	0.75	3.1
8.....	1.10	14.0	0.80	3.6	0.75	3.0
9.....	1.25	20.0	0.85	5.2	0.75	3.0
10.....	2.25	62.0	0.80	3.8	0.73	2.4
11.....	1.20	18.0	0.75	2.6	0.73	2.4
12.....	1.05	12.0	0.80	3.9	0.70	1.7
13.....	0.95	7.8	0.75	2.7	0.70	1.7
14.....	1.15	16.0	0.90	7.3	0.70	1.6
15.....	1.00	9.7	0.85	5.6	0.67	1.0
16.....	1.75	41.0	0.90	7.4	0.66	0.8
17.....	1.65	37.0	0.80	4.2	0.66	0.8
18.....	1.70	39.0	0.80	4.2	0.65	0.7
19.....	1.25	20.0	0.85	5.8	0.65	0.7
20.....	1.10	14.0	0.80	4.3	0.75	2.4
21.....	1.15	16.0	0.78	3.9	0.80	3.6
22.....	1.25	20.0	0.76	3.3	0.75	2.3
23.....	1.00	9.7	0.94	9.3	0.67	0.8
24.....	0.95	7.8	0.90	7.9	0.67	0.8
25.....	1.00	9.7	0.87	7.8	0.75	2.2
26.....	0.95	7.8	0.85	7.2	0.80	3.3
27.....	0.95	7.8	0.85	7.2	0.72	1.4
28.....	0.90	6.0	0.85	7.2	0.70	1.0
29.....	0.95	7.8	0.80	4.6	0.70	1.0
30.....	0.95	8.0	0.80	4.6	0.90	6.0
31.....			0.78	4.1		

DAILY GAUGE HEIGHT AND DISCHARGE of Skull Creek at Doyle's Ranche, Sask., for 1911.— *Con.*

DAY.	July.		August.		September.		October.	
	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0 85	4 6	0 65	0 4	0 74	1 1	0 78	1 9
2.....	0 95	7 8	0 65	0 4	0 75	1 3	0 78	1 9
3.....	0 85	4 6	0 65	0 4	0 75	1 3	0 78	1 9
4....	0 85	4 6	0 65	0 4	0 85	3 6	0 78	1 9
5....	0 85	4 6	0 70	0 9	0 87	4 1	0 78	1 9
6.....	0 80	3 1	0 75	1 8	1 00	8 5	0 78	1 9
7.....	0 76	2 3	0 75	1 7	1 00	8 5	0 80	2 3
8.....	0 73	1 6	0 82	3 3	0 90	5 0	0 80	2 3
9.....	0 75	2 0	0 80	2 6	0 90	5 0	0 80	2 3
10.....	0 75	2 0	0 80	2 6	0 85	3 6	0 78	1 9
11.....	0 72	1 4	0 75	1 6	0 80	2 3	0 80	2 3
12....	0 72	1 4	0 75	1 6	0 80	2 3	0 80	2 3
13.....	0 70	1 0	0 75	1 6	0 80	2 3	0 80	2 3
14.....	0 70	1 0	0 73	1 2	0 80	2 3	0 80	2 3
15.....	0 73	1 6	0 70	0 7	0 80	2 3	0 80	2 3
16.....	0 75	2 0	0 70	0 7	0 80	2 3	0 80	2 3
17.....	0 75	2 0	0 70	0 7	0 82	2 8	0 85	3 6
18.....	0 72	1 4	0 70	0 6	0 82	2 8	0 85	3 6
19.....	0 72	1 4	0 72	0 9	0 82	2 8	0 86	3 8
20.....	0 72	1 4	0 72	0 8	0 82	2 8	0 86	3 8
21.....	0 70	1 0	0 72	0 8	0 83	3 0	0 88	4 4
21.....	0 70	1 0	0 72	0 8	0 85	3 6	0 88	4 4
23.....	0 68	0 8	0 73	0 9	0 85	3 6	0 88	4 4
24.....	0 68	0 8	0 73	0 9	0 85	3 6	0 88	4 4
25.....	0 66	0 6	0 73	1 0	0 85	3 6	.....	b ...
26.....	0 65	0 5	0 75	1 3	0 83	3 0	.....	.....
27.....	0 65	0 5	0 76	1 5	0 80	2 3	.....	.....
28.....	0 63	0 4	0 75	1 3	0 80	2 3	.....	.....
29.....	0 63	0 4	0 75	1 3	0 80	2 3	.....	.....
30.....	0 64	0 4	0 75	1 3	0 80	2 3	.....	.....
31.....	0 65	0 4	0 76	1 5	.....	.....	.....	.....

a Sta. established.
b Stream frozen over.

MONTHLY DISCHARGE of Skull Creek at Doyle's Ranche, Sask., for 1911.
(Drainage area, 20 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
April (8-30).....	6.2	6.0	17 90	0.895	0.766	815
May.....	9.3	2.6	5.33	0.266	0.307	328
June.....	6.0	0.7	2.28	0.114	0.127	136
July.....	7.8	0.4	1.89	0.094	0.108	116
August.....	3.3	0.4	1.21	0.065	0.075	74
September.....	8.5	1 1	3.22	0.161	0 180	192
October (1-24).....	4.4	1.9	2.77	0.138	0.123	132
The period.....					1.686	1793

FEARON AND MOORHEAD SKULL CREEK DITCH, NEAR SKULL CREEK, SASK.

This station was established July 6, 1911, by G. R. Elliott, on Messrs. Fearon and Moorhead's ditch, which diverts water from Skull Creek on the N.E. ¼ Sec. 29, Tp. 10, Rge. 22, W. 3rd Mer.

The gauge is located on the N.E. ¼ Sec. 29, and is about ninety feet from the intake. It is a plain staff graduated into feet and inches, and is on the right bank of the ditch. The zero

SESSIONAL PAPER No. 25d

(elev., 90.86) is referred to a permanent iron bench-mark (assumed elev., 100.00 , located 180 feet S 25' E.

The station is at a uniform cross-section of the ditch, which is five feet wide at the bottom with side slopes of one to one.

As the gauge was not established until late in the season, no gauge-height observations were obtained. Considerable water was diverted through this ditch earlier in the season.

DISCHARGE MEASUREMENTS of Fearon and Moorhead Skull Creek Ditch near Skull Creek, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Inches.</i>	<i>Sec.-ft.</i>
July 6.....	G. R. Elliott.....				5	0.239*
Aug. 22 ..	G. H. Whyte.					Nil.

* Weir measurement.

FEARON AND MOORHEAD MAIN DITCH NEAR SKULL CREEK, SASK.

This station was established July 4, 1911, by G. R. Elliott, on Messrs. Fearon and Moorhead's main irrigation ditch, which diverts water from Skull and Bridge Creeks. The two branches join on the N.E. ¼ Sec. 33, Tp. 10, Rge. 22, W. 3rd Mer.

The gauge is located on the flume on the N.E. ¼ Sec. 33 and about 75 feet from the junction of the two branches of the ditch. It is a plain staff graduated to feet and inches, and is nailed at the centre of the right side of the flume. The zero (elev., 89.19) is referred to the top of a rock (assumed elev., 100.00), situated 140 feet northeast of the flume and on the right side of the ditch.

The flume is constructed of timber and has a bottom width of eight feet, with sides two feet in height.

As the gauge was established late in the irrigation season, no observations of gauge-height were obtained.

DISCHARGE MEASUREMENTS of Fearon and Moorhead Main Ditch near Skull Creek, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Inches.</i>	<i>Sec.-ft.</i>
June 2.....	G. H. Whyte.....	5 4	2.55	0.557		1.420
June 2.....	do					0.165*a.b.
July 3.....	F. T. Fletcher & G. H. Whyte					1.133*a.c.
July 3.....	do					1.251*
July 4.....	G. R. Elliott ..				3	0.937*
Aug. 22.....	G. H. Whyte.....					Nil.

* Weir measurement.

a. Measurement made above reservoir at 14-11-22-3.

b. In 8 miles of ditch there was seepage loss of 1.255 sec.-ft. or 0.157 sec.-ft. per mile. Warm wind and very dry.

c. In 8 miles of ditch there was seepage loss of 0.118 sec.-ft. or 0.015 sec.-ft. per mile. Cool and had been raining.

SKULL CREEK NEAR SKULL CREEK, SASK.

This station was established June 29, 1908, by F. T. Fletcher. It is located on the N.W. ¼ Sec. 10, Tp. 11, Rge. 22, W. 3rd Mer., at the highway bridge on the surveyed trail running east from Maple Creek. It is about two miles north of Skull Creek post office, and about twenty-five miles east of Maple Creek, by trail.

The channel is straight for 100 feet above and 150 feet below the station. Both banks are high and not liable to overflow. The banks are clear of brush for about fifty feet above and below the station, and then become densely wooded. The bed of the stream is composed of sand, and may shift somewhat at high stages. The current is moderate.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to the centre pile on the upstream, or south side of the bridge. It is referred to bench-marks as follows: (1) a bolt-head surrounded by a circle of nails in the top of the stringer at the right, or east, abutment on the upstream side of the bridge (elevation, 11.96 feet above the zero of the gauge); (2) the top of the iron pin in the road mound about fifty feet southeast of the bridge on the right, or east bank (elevation, 14.19 feet above the zero of the gauge).

Discharge measurements are made from the upstream side of the bridge. The initial point for soundings is the inner face of the right abutment of the bridge. There is only one channel at low stages, but owing to the centre row of piles supporting the bridge there are two channels at high stages of the stream. Low-water measurements are made at or near the gauge by wading, and at very low stages a weir is used.

During 1911, the gauge was read by James Mann.

DISCHARGE MEASUREMENTS of Skull Creek near Skull Creek, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 7	G. H. Whyte.....	6.7	5.98	0.624	1.350	3.730
April 9.....	do	21.0	36.90	1.147	3.350	42.570
June 2.....	do	5.8	1.48	0.824	0.520	1.220
July 12.....	G. R. Elliott.....	5.0	3.34	0.461	0.535	1.540
July 25.....	G. H. Whyte.....				0.430	0.605†
Aug. 24.....	do				0.420	0.598†
Sept. 30.....	do				0.630	1.551†

† Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Skull Creek near Skull Creek, Sask., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1...					1 34	6.9	0.60	1.5
2...			b		1 22	5.8	0 52	1.1
3...			1 46	8.1	1 21	5.7	0 50	1.1
4...			b		0 88	3.2	0 53	1.2
5...			b		0 84	2.9	0 56	1.4
6...			b		0 94	3.6	0 56	1.4
7...			1.35	7.0	0 83	2.8	0 57	1.5
8...			1.35	7 0	0 69	2.0	0 59	1.6
9...			2.65	26 0	0 69	2.0	0 59*	1 6
10...			4.39	74 0	0 68	1.9	0 59	1.6
11...			3.42	45 0	0 70	2.0	0 57*	1.5
12...			2.99	33 0	0 70	2.0	0 55	1.4
13...			2.44	22 0	0 64	2.0	0 54	1.4
14...			1.31	6 6	0 69	2.0	0 50	1 1
15...			2.15	17 0	0 70	2.0	0 42	0.8
16...			2.20	18 0	0 71	2.1	0 34	0.5
17...			3.08	35 0	0 71	2.1	0 29	0.4
18...			2.06	16 0	0 70	2.0	0 29	0.4
19...			2.11	16 0	0 88	3.2	0 25	0.3
20...			1.92	14 0	0 69	2.0	0 39	0.7
21...			1.58	9 3	0 69	2.0	0 68	2.2
22...			1.52	8 7	0 69	2.0	0 58	1.7
23...			1.45	8 0	0 68	1.9	0 56	1.6
24...			1 46	8 1	0 69*	2.0	0 56	1.6
25...	1.86	a	1.46	8 1	0 72	2.1	0 56	1.6
26...	4.00	a	1.46	8 1	0 84	2.9	0 57	1.6
27...	4.25	a	1.16	5 3	0 86	3.0	0 56	1.6
28...	4.86	a	1.41	7 6	0 83*	2.8	0 54	1.5
29...	4.12	a	1.65	10 0	0 82	2.7	0 65	2.1
30...	4.12	a	1.40	7 5	0 70	2.0	0 74	2.6
31...	3.34	a			0 73	2.2		

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Skull Creek near Skull Creek, Sask., for 1911.—*Con.*

DAY.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0.85	1.1	0.41	0.6	0.26	0.2	0.63*	1.5	0.76	a
2	0.69*	2.3	0.44	0.8	0.29	0.3	0.56	1.3	0.80	a
3	0.54	1.5	0.45	0.8	0.32	0.4	0.64	1.7	0.84	a
4	0.54	1.5	0.46	0.8	0.38	0.5	0.75	2.3	0.84	a
5	0.54	1.5	0.48	0.9	1.01	4.1	0.74	2.2	0.84	a
6	0.54	1.5	0.72	2.1	1.95	14.0	0.74	2.2	0.86	a
7	0.51	1.4	0.74	2.2	1.68	10.0	0.73	2.2		
8	0.52	1.4	0.64	1.7	0.70	2.0	0.71*	2.1		
9	0.52*	1.4	0.58	1.4	0.70	2.0	0.69	2.0		
10	0.52	1.4	0.56	1.3	0.67	* 1.8	0.68	1.9		
11	0.52	1.4	0.56	1.3	0.62	1.6	0.67	1.8		
12	0.50	1.3	0.40	0.6	0.58	1.4	0.66	1.8		
13	0.57	1.7	0.40	0.6	0.51	1.2	0.65	1.8		
14	0.51	1.3	0.44	0.8	0.54	1.2	0.65	1.8		
15	0.53	1.4	0.41	0.6	0.56	1.3	0.65	1.8		
16	0.56	1.6	0.39	0.6	0.58	1.4	0.65	1.8		
17	0.58	1.7	0.38	0.5*	0.67	1.8	0.65	1.8		
18	0.59	1.7	0.36	0.5	0.72	2.1	0.66	1.8		
19	0.56	1.5	0.36	0.5	0.68	1.9	0.68	1.9		
20	0.54	1.3	0.36	0.5	0.51	1.0	0.69	2.0		
21	0.53	1.3	0.42	0.7	0.54	1.2	0.70	2.0		
22	0.43	0.8	0.42	0.7	0.69	2.0	0.71	2.1		
23	0.45	0.9	0.42	0.7	0.72	2.1	0.71	2.1		
24	0.42	0.7	0.42	0.7	0.74	2.2	0.71	2.1		
25	0.43	0.7	0.46	0.8	0.74	2.2	0.72	2.1		
26	0.39	0.6	0.39	0.6	0.70	2.0	0.72	2.1		
27	0.36	0.5	0.36	0.5	0.67	1.8	0.72	2.1		
28	0.34	0.4	0.34	0.4	0.64	1.7	0.72	2.1		
29	0.36	0.5	0.36	0.5	0.63	1.7	0.72	2.1		
30	0.37	0.5	0.37	0.5	0.63	1.7	0.73	2.2		
31	0.39	0.6	0.29	0.3			0.74	2.2		

* Gauge height interpolated.
a Ice in stream.
d No gauge height observed.

MONTHLY DISCHARGE of Skull Creek near Skull Creek, Sask., for 1911.

(Drainage area, 33 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
April (3, 7-30)	74.0	5.3	17.000	0.515	0.479	843
May	6.9	1.9	2.700	0.082	0.094	166
June	2.6	0.3	1.350	0.041	0.046	80
July	3.4	0.4	1.280	0.039	0.045	79
August	2.2	0.3	0.823	0.025	0.029	51
September	14.0	0.2	2.290	0.069	0.077	136
October	2.3	1.3	1.96	0.059	0.068	121
The period					.838	1476

CRANE LAKE DRAINAGE BASIN.

General Description.

Crane Lake is one of the largest of the lakes which receive their supply from the drainage of the northern slope of the Cypress Hills. It is situated in Tp. 13, Rge. 23, W. 3rd Mer., and covers an area of 25 square miles.

The lake, which has no outlet, is shallow, and the water is saline in character. It is fed by Piapot Creek, which rises in the Cypress Hills and flows northeastward, being joined by Bear Creek in Sec. 7, Tp. 12, Rge. 22, W. 3rd Mer., before it reaches the lake.

The country to the north of the lake is rolling and of little use, being the eastern end of a range of sand hills which extend northwestward some forty miles. South of the lake the country is rolling prairie which is devoid of tree growth except along the creeks, where there is small growths of willow and shrubs. As one gets closer to the hills the country becomes more broken and the tree growth increases, making the ravines and coulees at the head of the creeks, natural reservoirs which regulate the spring run-off considerably.

There are a number of irrigation schemes, in operation and proposed, in this basin, also one or two industrial schemes along the main line of the Canadian Pacific Railway.

The mean annual precipitation of the northern part of the basin is about twelve inches, but in the hills this is exceeded. During 1911, the rainfall was much greater. During the winter season, from November to April, the streams are frozen over.

EAST BRANCH OF BEAR CREEK AT JOHNSON'S RANCHE, SASK.

This station was established August 18, 1909, by H. R. Carscallen. It is located on the S.E. 1/4 Sec. 21, Tp. 10, Rge. 23, W. 3rd Mer., about a mile and a half southeast of Skibereen post office.

The channel is straight for 50 feet above and 40 feet below the station. Both banks are high and not liable to overflow, except during extreme floods. The banks are free from brush at the station, but are wooded above and below. The bed of the stream is composed of coarse gravel and stones. Large stones in the bed of the stream make accurate soundings at the station rather difficult to obtain. The current is moderate.

The gauge, which is a plain staff graduated to feet and hundredths, is attached to a vertical post sunk in the bed of the stream at the right bank and securely stayed. The zero (elev., 92.63) is referred to a permanent iron bench-mark (assumed elev., 100.00), situated on the right bank in the line of the gauging section and 53 feet from the gauge.

Discharge measurements are made at or near the gauge by wading, or by means of a weir. A measuring wire is stretched across the stream at the section. The initial point for soundings is a square stake driven close to the ground on the left bank and marked "I.P."

During 1911, the gauge was read by Ralph Johnson.

DISCHARGE MEASUREMENTS of East Branch of Bear Creek at Johnson's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 6	G. H. Whyte...	11.0	4.56	1.469	1.04	6.70
April 27	do	10.4	6.85	1.230	0.66	8.39
June 1	do	10.0	5.42	0.755	0.54	4.09
June 26	G. R. Elliott	13.0	12.50	0.320	0.53	4.45
June 28	G. H. Whyte.	7.0	2.85	1.007	0.46	2.87
July 20	do	6.6	2.29	0.573	0.35	1.28*
July 20	do	6.6	2.74	0.474	0.35	1.30
Aug. 23	do	...	1.95	0.533	0.34	1.04*
Sept. 29	do	6.0	2.70	1.077	0.45	2.92

* Weir measurement.

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of East Branch of Bear Creek at Johnson's Rancho, Sask., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1 29	16 0	0 7	10 0	0 60	6 1
2			*1.28	16 0	0 7	10 0	0 60	6.1
3			1.28	16 0	0 7	10 0	0 60	6.1
4			1.28	16 0	0 7	10 0	0 60	6.1
5			1.28	16 0	0 7	10 0	0 50	3.6
6			1 04	6 7	0 7	10 0	0 50	3.6
7			1.80	32 0	*0.6	6 1	0 50	3.6
8			1.80	34 0	0 6	6 1	0 50	3.6
9			1.70	35 0	0 6	6 1	0 50	3.6
10			1.20	16 0	0 6	6 1	0 50	3.6
11			1.20	17 0	0 6	6 1	0 50	3.6
12			0.70	1 9	0 6	6 1	0 40	1.9
13			0.80	4 0	0 6	6 1	0 40	1.9
14			0.80	4 6	*0.6	6 1	0 40	1.9
15			0.80	5 0	0 7	10 0	0 40	1 9
16			0.90	9 1	0 7	10 0	0 40	1.9
17			0.95	12 0	0 7	10 0	0 40	1.9
18			0.98	14 0	0 7	10 0	0 40	1.9
19			0.84	9 1	0 6	6 1	*0 40	1.9
20			0.80	8 3	0 6	6 1	*0 40	1.9
21			0.80	9 0	*0.6	6 1	*0 40	1.9
22			0.80	9 8	0 7	10 0	0 40	1.9
23			*0.77	9 6	0 7	10 0	0 40	1.9
24			0.75	9 5	0 7	10 0	0 40	1.9
25			0.75	10 0	0 7	10 0	*0 40	1.9
26			0.70	9 3	0 7	10 0	0 40	1.9
27	1.31	17 0	0.65	7 8	0 7	10 0	0 40	1.9
28	1.31	17.0	0.70	10 0	*0.6	6 1	0 40	1.9
29	1.30	17.0	0.70	10 0	0 6	6 1	0 42	2.2
30	1.30	17.0	0.70	10 0	0 6	6 1	0 43	2.4
31	1.19	12.0			*0.6	6 1		

DAILY GAUGE HEIGHT AND DISCHARGE of East Branch of Bear Creek at Johnson's Ranche, Sask., for 1911.—Continued.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0 42	2 2	0 29	0 8	0 35	1 4	0 45	2.8
2.....	* 0 43	2 4	0 30	0 9	0 33	1 2	0 46	3.0
3.....	0 45	2 8	0 30	0 9	* 0 34	1 3	0 45	2.8
4.....	0 46	3 0	0 31	1 0	0 35	1 4	0 44	2.6
5.....	0 46	2 8	0 35	1 4	0 36	1 5	0 44	2.6
6.....	0 46	3 0	0 36	1 5	0 37	1 6	0 45	2.8
7.....	0 46	3 0	0 45	2 8	0 40	1 9	* 0 45	2.8
8.....	0 46	3 0	0 51	3 8	0 37	1 6	0 46	3.0
9.....	* 0 45	2 8	0 46	3 0	0 36	1 5	0 40	1.9
10.....	0 45	2 8	0 40	1 9	* 0 34	1 3	0 45	2.8
11.....	0 45	2 8	0 40	1 9	0 33	1 2	0 44	2.6
12.....	0 45	2 8	0 39	1 8	0 36	1 5	0 45	2.8
12.....	0 42	2 2	0 37*	1 6	0 33	1 2	0 45	2.8
14.....	0 42	2 2	0 36	1 5	0 32	1 1	* 0 45	2.8
15.....	0 42	2 2	0 32	1 1	0 33	1 2	0 45	2.8
16.....	* 0 42	2 2	0 31	1 0	0 32	1 1	0 44	2.6
17.....	0 43	2 4	0 30	0 9	* 0 34	1 3	0 46	3.0
18.....	0 40	1 9	0 31	1 0	0 36	1 5	0 45	2.8
19.....	0 35	1 4	0 29	0 8	0 34	1 3	0 46	3.0
20.....	0 30	0 9	* 0 32	1 1	0 38	1 7	0 46	3.0
21.....	0 30	0 9	0 35	1 4	0 45	2 8	* 0 46	3.0
22.....	0 30	0 9	0 37	1 6	0 50	3 6	0 47	3.1
23.....	0 30	0 9	0 35	1 4	0 32	1 1	0 48	3.3
24.....	0 30	0 9	0 30	0 9	* 0 38	1 7	†	
25.....	0 30	0 9	0 32	1 1	0 45	2 8		
26.....	0 30	0 9	0 36	1 5	0 45	2 8		
27.....	0 35	1 4	* 0 35	1 4	0 44	2 6		
28.....	0 36	1 5	0 35	1 4	0 45	2 8		
29.....	0 35	1 4	0 33	1 2	0 45	2 8		
30.....	* 0 30	0 9	0 33	1 2	0 43	2 4		
31.....	0 30	0 9	0 34	1 3				

* No observation. Gauge-height interpolated.
† Creek frozen over.

MONTHLY DISCHARGE of East Branch of Bear Creek at Johnson's Ranche, Sask., for 1911.
(Drainage area, 22 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET			RUN-OFF		
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
March (27-31).....	17.0	12.0	16.00	0.728	0.135	159
April.....	35.0	1.9	12.80	0.582	0.649	762
May.....	10.0	6.1	8.10	0.368	0 424	498
June.....	6.1	1.9	2.90	0.132	0 147	173
July.....	3.0	0.9	1 95	0.089	0.103	120
August.....	3.8	0.8	1.50	0.068	0.078	92
September.....	3.6	1.1	1.80	0.082	0.092	107
October (1-23).....	3.3	1.9	2.80	0 127	0.108	128
The period.....					1.736	2039

WEST BRANCH OF BEAR CREEK AT BERTRAM'S RANCHE, SASK.

This station was established September 16, 1909, by H. R. Carscallen. It is located on the S.W. ¼ Sec. 32, Tp. 10, Rge. 23, W. 3rd Mer., about a mile and a half north of Skibereen post office. It is about three hundred yards above the junction of this branch with the east branch of Bear Creek.

The channel is straight for 25 feet above and 15 feet below the station. Both banks are comparatively high and will overflow only in extreme flood. The banks are free from brush at the

SESSIONAL PAPER No. 25d

station, but are heavily wooded immediately above and twenty feet below. The bed of the creek is composed of sand and coarse gravel. The current is moderate at the station, but becomes very swift twenty feet downstream.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post sunk in the bed of the stream at the left bank and firmly stayed to the bank. It is referred to bench-marks as follows:— 1 a spike-head in the top of the initial-point stake on the left bank, marked "B.M." (elevation, 8.00 above the zero of the gauge); (2) a spike-head in the top of a pointed poplar stump just below the bank on the left side of the stream, and about 50 feet downstream from the gauge, the stump blazed and marked "B.M." (elevation, 8.41 feet above the zero of the gauge).

During ordinary stages discharge measurements are made at, or a short distance below, the gauge by wading. High-water measurements are made at the government bridge, situated about three-quarters of a mile upstream. The initial point for soundings at the station is a square stake driven close to the ground on the left bank and marked "I.P."

During 1911, the gauge was read by Charles Bertram.

DISCHARGE MEASUREMENTS of West Branch of Bear Creek at Bertram's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 7.....	G. H. Whyte.....	12.0	9.40	0.970	1.34	9.120
April 27.....	do	18.0	11.60	1.280	1.46	14.780
June 1.....	do	20.0	10.72	0.911	1.34	9.760
June 26.....	G. R. Elliott.....	17.3	7.97	0.849	1.34	6.780
June 28.....	G. H. Whyte.....	7.40	3.44	1.064	1.22	3.660
July 20.....	do	7.70	2.66	0.808	1.16	2.150
July 20.....	do				1.16	2.073*
Aug. 23.....	do				1.16	1.565*
Sept. 29.....	do	7.0	3.22	1.460	1.26	4.560

* Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of West Branch of Bear Creek at Bertram's Ranche, Sask., for 1911.

DAY.	April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.60	23 0	1.55	20 0	1.34	8.5
2.....	1.60	23 0	1.55	20 0	1.34	8.5
3.....	1.50	17 0	1.55	20 0	1.34	8.5
4.....	1.50	17 0	1.45	14 0	1.30	6.6
5.....	1.75	32 0	1.40	11 4	1.30	6.6
6.....	1.40	11 4	1.40	11 4	1.35	9.0
7.....	1.35	9 0	1.40	11 4	1.35	9.0
8.....	1.35	9 0	1.40	11 4	1.35	9.0
9.....	2.00	47 0	1.35	9 0	1.35	9.0
10.....	2.50	77.0	1.35	9 0	1.35	9.0
11.....	2.30	65 0	1.33	8 0	1.30	6.6
12.....	2.00	47 0	1.33	8 0	1.30	6.6
13.....	2.00	47 0	1.33	8 0	1.30	6.6
14.....	1.80	35 0	1.33	8 0	1.30	6.6
25.....	1.80	35 0	1.33	8 0	1.30	6.6
16.....	1.60	23 0	1.50	17 0	1.25	4.8
17.....	2.50	77 0	1.40	11 4	1.25	4.8
18.....	2.00	47 0	1.38	10 4	1.25	4.8
19.....	1.70	29 0	1.38	10 4	1.25	4.8
20.....	1.70	29 0	1.38	10 4	1.25	4.8
21.....	1.75	32 0	1.35	9 0	1.25	4.8
22.....	1.75	32 0	1.35	9 0	1.22	3.8
23.....	1.55	20 0	1.65	26 0	1.22	3.8
24.....	1.55	20 0	1.70	29 0	1.25	4.8
25.....	1.50	17.0	1.50	17 0	1.50	17.0
26.....	1.45	14 0	1.50	17 0	1.27	5.5
27.....	1.40	11 4	1.45	14 0	1.20	3.2
28.....	1.45	14 0	1.45	14 0	1.25	4.8
29.....	1.45	14 0	1.45	14 0	1.30	6.6
30.....	1.50	17.0	1.40	11 4	1.30	6.6
31.....			1.40	11 4		

DAILY GAUGE HEIGHT AND DISCHARGE of West Branch of Bear Creek at Bertram's Ranche, Sask., for 1911.—Continued.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.40	11.4	1.00	0.2	1.10	1.0	1.30	6.6
2.....	1.40	11.4	1.00	0.2	1.00	0.2	1.30	6.6
3.....	1.35	9.0	1.10	1.0	1.00	0.2	1.35	9.0
4.....	1.30	6.6	1.10	1.0	1.00	0.2	1.35	9.0
5.....	1.30	6.6	1.15	2.0	1.30	6.6	1.30	6.6
6.....	1.25	4.8	1.20	3.2	1.40	11.4	1.30	6.6
7.....	1.20	3.2	1.30	6.6	1.47	15.0	1.30	6.6
8.....	1.20	3.2	1.30	6.6	1.40	11.4	1.30	6.6
9.....	1.20	3.2	1.25	4.8	1.30	6.6	1.30	6.6
10.....	1.20	3.2	1.20	3.2	1.25	4.8	1.35	9.0
11.....	1.20	3.2	1.20	3.2	1.20	3.2	1.25	4.8
12.....	1.20	3.2	1.15	2.0	1.20	3.2	1.25	4.8
13.....	1.15	2.0	1.10	1.0	1.15	2.0	1.20	3.2
14.....	1.15	2.0	1.10	1.0	1.15	2.0	1.20	3.2
15.....	1.10	1.0	1.19	3.0	1.15	2.0	1.20	3.2
16.....	1.00	0.2	1.10	1.0	1.15	2.0	1.25	4.8
17.....	1.00	0.2	1.10	1.0	1.35	9.0	1.25	4.8
18.....	1.00	0.2	1.10	1.0	1.40	11.4	1.25	4.8
19.....	1.00	0.2	1.10	1.0	1.40	11.4	1.25	4.8
20.....	1.17	2.5	1.05	0.5	1.35	9.0	1.25	4.8
21.....	1.10	1.0	1.00	0.2	1.35	9.0	1.25	4.8
22.....	1.10	1.0	1.16	0.2	1.25	4.8	1.25	4.8
23.....	1.10	1.0	1.12	1.4	1.25	4.8	1.29	6.2
24.....	1.10	1.0	1.12	1.4	1.30	6.6	1.29	6.2
25.....	1.05	0.5	1.12	1.4	1.30	6.6	1.29	6.2
26.....	1.05	0.5	1.20	3.2	1.30	6.6	1.29	6.2
27.....	1.00	0.2	1.15	2.0	1.30	6.6	1.28	5.9
28.....	1.00	0.2	1.10	1.0	1.30	6.6	1.28	5.9
29.....	1.00	0.2	1.10	1.0	1.30	6.6	1.30	6.6
30.....	1.00	0.2	1.10	1.0	1.30	6.6	1.30	6.6
31.....	1.00	0.2	1.10	1.0	1.30	6.6	1.30	6.6

MONTHLY DISCHARGE of West Branch of Bear Creek at Bertram's Ranche, Sask., for 1911.
(Drainage area, 45 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	77.0	9.0	29.70	0.660	0.736	1767
May.....	29.0	8.0	13.20	0.294	0.339	812
June.....	17.0	3.2	6.72	0.149	0.166	400
July.....	11.4	0.2	2.69	0.060	0.069	165
August.....	6.6	0.2	1.91	0.042	0.048	117
September.....	15.0	0.2	5.91	0.131	0.141	352
October.....	9.0	3.2	5.88	0.131	0.151	362
The period.....					1.650	3975

BEAR CREEK NEAR UNSWORTH'S RANCHE, SASK.

This station was established June 22, 1908, by F. T. Fletcher. It is located on the S.E. 14 Sec. 18, Tp. 11, Rge. 23, W. 3rd Mer., at the highway bridge on the surveyed trail running east from Maple Creek. It is about half a mile south of S. Unsworth's ranche, and fifteen miles east of Maple Creek.

The channel is straight for 100 feet above and below the station. Both banks are high and not liable to overflow. The station is kept clear of underbrush, but both banks are covered with small trees above and below the bridge. The bed of the stream is sandy and is liable to change at high stages of the creek. The current is moderate, becoming sluggish at very low stages.

SESSIONAL PAPER No. 25d

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to the centre pile of the downstream side of the bridge. It is referred to bench-marks as follows:— (1) a circle of nail-heads in the top of the stringer at the left abutment on the downstream side of the bridge (elevation, 14.05 feet above the zero of the gauge); (2) the top of the iron pin in the road-mound southeast of the bridge on the left bank (elevation, 18.97 feet above the zero of the gauge).

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the inner face of the left abutment of the bridge. Low-water measurements are made at a wading section about half a mile downstream from the gauge, or about 200 feet above. There is only one channel at low stages, but at high stages the centre row of piles supporting the bridge divides the stream into two channels.

During 1911, the gauge was read by S. Unsworth.

DISCHARGE MEASUREMENTS of Bear Creek near Unsworth's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 6.....	G. H. Whyte.....	10.0	25.60	0.933	2.21	23.880
April 27.....	do	10.5	24.61	1.340	2.43	32.890
June 1	do	13.0	11.76	0.738	1.46	14.260
June 22.....	G. R. Elliott.....	10.4	11.38	0.538	0.88	6.120
June 26	G. H. Whyte.....	9.0	13.78	0.910	1.37	12.550
July 20.....	do	7.5	9.87	0.302	0.70	2.980
Aug. 22.....	do	7.0	6.92	0.156	0.38	1.078*
Sept. 29.....	do	9.3	12.10	0.662	1.11	8.010

* Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Bear Creek near Unsworth's Ranche, Sask., for 1911.

DAY.	April.		May		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1 ..	3.90	.....	3 00	44.	1 75	19 0	1 35	12.0
2 ..	3.55	.....	3 05	45.	1 50	15 0	2 00	24.0
3 ..	3.05	.....	3 00	44	1 45	14 0	2 05	25.0
4 ..	2.75	.....	2 95	43.	1 45	14 0	1 80	20.0
5...	2.20	.....	2 90	42.	1 60	16 0	1 65	17.0
6 ..	2.10	.....	2 80	40.	2 10	26 0	1 55	16.0
7...	2.05	.....	2 80	40.	1 90	22 0	1 40	13.0
8...	2.05	.....	2 75	39.	1 75	19 0	1 35	12.0
9 ..	4.10	.....	2 70	38.	1 70	18 0	1 30	11.0
10.	8.20	..	2 68	38.	1.60	16 0	1 30	11.0
11...	12.00	.....	2 70	38.	1 50	15 0	1 25	10.0
12...	9.80	.....	2 75	39.	1 45	14 0	1 20	9.5
13...	7.90	.....	2 75	39.	1 40	13 0	1 15	8.7
14...	3.40	.....	2 72	38.	1 30	11 0	1 05	7.2
15...	3.75	.....	2 70	38.	1 25	10 0	1.05	7.2
16...	4.50	.....	2 70	38.	1 10	7 9	0 95	5.8
17...	7.05	.....	2 75	39.	1 05	7 2	0 90	5.1
18...	11.00	.....	2 70	38.	0 90	5 1	0 90	5.1
19 ..	8.10	.....	2 50	34.	0 80	4 0	0 85	4.6
20...	5.40	.....	2 50	34.	0 80	4 0	0 80	4.0
21...	4.10	66.0	2 45	33.	0 85	4 6	0 75	3.6
22. ..	3.75	59.0	2 42	32.	0 90	5 1	0 70	3.1
23...	3.40	52.0	2 50	34.	0 95	5 8	0 70	3.1
24...	3.05	45.0	3 10	46.	0 95	5 8	0 70	3.1
25...	2.85	41.0	2 85	41.	1.00	6 4	0 65	2.8
26...	2.80	40.0	2 80	40.	1 05	7 2	0 65	2.8
27...	2.95	43.0	2 75	39.	1 05	7 2	0 65	2.8
28...	3.00	44.0	2 60	36.	1 05	7 2	0 62	2.5
29...	3.10	46.0	2 50	34.	1 10	7 9	0 62	2.5
30...	3.10	46.0	2 10	26.	1 25	8 4	0.60	2.4
31...	.....	.....	2 00	24.	.....	.....	0.60	2.4

DAILY GAUGE HEIGHT AND DISCHARGE of Bear Creek near Unsworth's Ranche, Sask., for 1911.—
Continued.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	0 60	2 4	0 58	2 3	0 95	5 8	1 10	7 9
2.	0 63	2 6	0 55	2 1	1 15	8 7	1 10	7.9
3.	0 65	2 8	0 55	2 1	1 25	10 0	1 05	7.2
4.	0 68	3 0	0 95	5 8	1 40	13 0	1 05	7.2
5.	0 70	3 1	1 40	13 0	1 35	12 0	1 05	7.2
6.	0 75	3 6	2 10	26 0	1 35	12 0	1 10	7.9
7.	0 85	4 6	2 15	27 0	1 30	11 0	1 15	8.7
8.	1 15	8 7	1 90	22 0	1 25	10 0	1 15	8.7
9.	1 05	7 2	1 50	15 0	1 25	10 0	1 15	8.7
10.	0 95	5 8	1 40	13 0	1 22	9 8	1 15	8.7
11.	0 90	5 1	1 30	11 0	1 20	9 5	1 15	8.7
12.	0 80	4 0	1 25	10 0	1 17	9 0	1 15	8.7
13.	0 75	3 6	1 10	7 9	1 15	8 7	1 15	8.7
14.	0 70	3 1	1 05	7 2	1 15	8 7	1 15	8.7
15.	0 72	3 3	1 05	7 2	1 12	8 2	1.15	8 7
16.	0 75	3 6	1 00	6 4	1 12	8 2		
17.	0 70	3 1	1 00	6 4	1 10	7 9		
18.	0 68	3 0	1 10	7 9	1 10	7 9		
19.	0 65	2 8	1 10	7 9	1 10	7 9		
20.	0 60	2 4	1 15	8 7	1 00	6 4		
21.	0 58	2 3	1 20	9 5	1 00	6 4		
22.	0 55	2 1	1 25	10 0	1 05	7 2		
23.	0 55	2 1	1 30	11 0	1 10	7 9		
24.	0 50	1 8	1 30	11 0	1 15	8 7		
25.	0 50	1.8	1 25	10 0	1 17	9 0		
26.	0.55	2.1	1 20	9 5	1 20	9 5		
27.	0.65	2.8	1 18	9 2	1 25	10 0		
28.	0 65	2.8	1 15	8 7	1.25	10 0		
29.	0.62	2.5	1 10	7 9	1 20	9.5		
29.	0 60	2.4	0.95	5.7	1.20	9 5		
31.	0.60	2.4			1.15	8.7		

As the stream was full of snow and ice April 1st to April 21st. the daily discharge was not taken as the curve will not apply.

MONTHLY DISCHARGE of Bear Creek near Unsworth's Ranche, Sask., for 1911.
(Drainage area, 100 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
Apr 1 to 21-30	69.0	40.0	48.20	0.482	0.179	954
May	46.0	24.0	37.80	0.378	0.436	2424
June	26.0	4.0	11.20	0.112	0.125	666
July	25.0	2.4	8.37	0.084	0.097	515
August	8.7	1.8	3.32	0.033	0.038	204
September	27.0	2.1	10.00	0.100	0.112	595
October	13.0	5.8	9.07	0.091	0.105	558
November	8.7	7.2	8.24	0.082	0.046	215
The period.					1.138	6661

NEEDHAM BROTHERS' DITCH NEAR PIAPOT, SASK.

This station was established on June 22, 1911, by G. R. Elliott, on the irrigation ditch of Messrs. Needham Brothers, which diverts water from Bear Creek on the S.W. ¹/₄ Sec. 30, Tp. 11, Rge. 23, W. 3rd Mer.

SESSIONAL PAPER No. 25d

The gauge is located on the S.W. ¼ Sec. 30, at the outlet of the sluice-box. It is a plain staff graduated to feet and inches. The zero of the gauge (elev., 97.47) is referred to a plug on the right bank of ditch (assumed elev., 100.00).
The station is on a uniform cross-section of the ditch, which has a bottom width of seven feet with side slopes of one to one.
As this station was established after the irrigation season was over, no records were obtained during 1911.

BRANIFF DITCH NEAR PIAPOT, SASK.

This station was established June 22, 1911, by G. R. Elliott, on D. Braniff's irrigation ditch, which diverts water from Bear Creek on the S.E. ¼ Sec. 30, Tp. 11, Rge. 23, W. 3rd Mer.
The gauge is located on the S.E. ¼ Sec. 30, about twenty feet from the point of intake. The gauge, which is a plain staff graduated to feet and inches, is fixed to the upstream side of a log bridge across the ditch.
No records were obtained at this station during 1911.

BEVERIDGE EAST DITCH ON PIAPOT CREEK, SASK.

This station was established June 9, 1911, by G. R. Elliott, on the irrigation ditch of D. Beveridge, which diverts water from Piapot Creek on the N.E. ¼ Sec. 7, Tp. 10, Rge. 24, W. 3rd Mer., to irrigate land on the east side of the creek.
The gauge is located on N.E. ¼ Sec. 7, and is about half a mile from the intake. The gauge, which is a plain staff graduated to feet and inches, is located at the upstream side of the bridge over the ditch.
The station is at a uniform cross-section of the ditch, which is three feet wide at the bottom with side slopes of one to one.
As the ditch was used for only a few days after the gauge was established, discharge measurements only were made.

DISCHARGE MEASUREMENTS of Beveridge East Ditch on Piapot Creek, Sask., in 1911.

Date.		Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq.-ft.	Fl. per sec.	Inches.	Sec.-ft.
June	9.....	G. R. Elliott.....				14.5	1.414*
do	.....	do				15.0	1.625*
do	.....	do				14.0	1.153*
do	.....	do				13.9	1.050*
do	.....	do				13.5	0.868*
do	.....	do				13.0	0.611*
Aug.	20.....	G. H. Whyte.....					Nil.

* Weir measurement.

BEVERIDGE WEST DITCH ON PIAPOT CREEK, SASK.

This station was established June 5, 1911, by F. T. Fletcher, on the irrigation ditch of D. Beveridge, which diverts water from Piapot Creek on the N.W. ¼ Sec. 18, Tp. 10, Rge. 24, W. 3rd Mer., to irrigate land on the west side of the creek.
The gauge is located on N.W. ¼ Sec. 18, and is about 240 feet from the intake. The gauge, which is a plain staff graduated to feet and inches, is located at the left side of the ditch.
The zero of the gauge (elev., 98.16) is referred to a peg in a cairn of stones (assumed elev., 100.00), located upstream from the gauge, and on the left bank.
The station is at a uniform cross-section of the ditch, which is two feet wide at the bottom with side slopes of one to one.
As the ditch was used for only a few days after the gauge was established, discharge measurements only were made.

DISCHARGE MEASUREMENTS of Beveridge West Ditch on Piapot Creek, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Inches.</i>	<i>Sec.-ft.</i>
June 9	G. R. Elliott.....				12 00	0.391*
do	do				11 50	0.150*
do	do				11 50	0.226*
do	do				12 50	0 456*
do	do				12 90	0.530*
do	do				12.75	0 499*
Aug. 20.....	G. H. Whyte.....					Nil.

* Weir measurement.

MOORHEAD DITCH ON PIAPOT CREEK, SASK.

This station was established June 10, 1911, by G. R. Elliott, on the irrigation ditch of Mr. H. Moorhead, which diverts water from Piapot Creek on the S.E. 14 Sec. 25, Tp. 10, Rge. 22, W. 3rd Mer.

The gauge is located on the N.W. 14 Sec. 25, about three-quarters of a mile from the point of intake. The gauge, which is a plain staff graduated into feet and inches, is at the right side of the ditch. The zero (elev., 98.23) is referred to a wooden stake (assumed elev., 100.00), situated on the left bank.

This station is at a regular cross-section of the ditch, which is three and a half feet wide at the bottom with side slopes of one to one.

No data was secured as to the quantity of water diverted before the gauge was established.

MONTHLY DISCHARGE of Moorhead Ditch on Piapot Creek, Sask., for 1911.

MONTH.	DISCHARGE IN SECOND-FEET.			RUN OFF.
	Maximum.	Minimum.	Mean.	Total in Acre-Feet.
June (10-30).....	4.2	0.56	1.31	547
July (1-15).....	6.9	0.56	3.27	97
The periods				644

NOTE.—These results cover only period after gauge was established on June 10.

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Moorhead Ditch on Piapot Creek, Sask., for 1911.

DAY.	June.		July	
	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			20	6.90
2.....			19	6.30
3.....			18	5.70
4.....			18	5.70
5.....			20	6.90
6.....			15	3.90
7.....			12	2.15
8.....			12	2.15
9.....			12	2.15
10.....	9.5	1.22	11	1.73
11.....	12.0	2.15	11	1.73
12.....	10.0	1.38	10	1.38
13.....	10.0	1.38	9	1.07
14.....	10.0	1.38	8	0.80
15.....	10.0	1.38	7	0.56
16.....	8.0	0.80		
17.....	9.0	1.07		
18.....	7.5	0.68		
19.....	7.0	0.56		
20.....	8.0	0.80		
21.....	7.0	0.56		
22.....	10.0	1.38		
23.....	7.5	0.68		
24.....	7.0	0.56		
25.....	15.5	4.20		
26.....	12.5	2.42		
27.....	10.0	1.38		
28.....	9.0	1.07		
29.....	8.0	0.80		
30.....	11.0	1.73		
31.....				

DISCHARGE MEASUREMENTS of Moorhead Ditch on Piapot Creek, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Fl. per sec.	Fl., Ins.	Sec.-ft.
June 10.....	G. R. Elliott .. .				0-7 ¹ / ₂	0.672*
do	do .. .				0-11	1.730*
do	do .. .				0-9 ¹ / ₄	1.153*
do	do .. .				1-0	2.146*
do	do .. .				1-1	2.422*
do	do .. .				1 1 ¹ / ₂	3.005*
Aug. 20.....	G. H. Whyte... .					Nil.

* Weir measurement.

PIAPOT CREEK AT CUMBERLAND'S RANCHE, SASK.

This station was established June 17, 1908, by F. T. Fletcher. It was originally located on Sec. 17, Tp. 11, Rge. 24, W. 3rd Mer., at the highway bridge on the surveyed trail running east of Maple Creek and about nine miles from Maple Creek. On account of the difficulty of obtaining an observer, it was moved on May 13, 1909, by H. R. Carscallen to a wading section near A. Cumberland's house. It is now located in the N.E. ¼ Sec. 18, Tp. 11, Rge. 24, W. 3rd Mer., about one mile north of the bridge.

The channel is straight for 50 feet above and 100 feet below the station. The right bank is high and not liable to overflow; the left is comparatively low and will overflow at flood stages of the stream. The bed of the stream is composed of sand, and may shift during high stages. The current is sluggish. During the summer months vegetation in the stream-bed gives considerable trouble.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post sunk in the bed of the stream at the left bank and securely stayed to the bank. The zero (elev., 89.75) is referred to a permanent iron bench-mark (assumed elev., 100.00), located on the right bank 47 feet N 40° E from the gauge, and sunk within five inches of the ground.

During ordinary stages, discharge measurements are made from the downstream side of the bridge at the old station.

During 1911, the gauge was read by A. Cumberland.

DISCHARGE MEASUREMENTS of Piapot Creek at Cumberland's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 5	G. H. Whyte.....	10.0	16.93	0.765	2.21	12.96
April 26	do	8.8	6.49	0.980	1.40	6.41
May 31	do	8.2	6.94	0.537	1.16	3.50
June 27	do	8.5	10.42	0.355	1.41	3.70
July 19	do	8.5	11.00	0.208	1.45	2.29
Aug. 22	do	8.3	8.97	0.185	1.25	1.65
Sept. 27	do	8.5	12.50	0.416	1.67	5.10

DAILY GAUGE HEIGHT AND DISCHARGE of Piapot Creek at Cumberland's Ranche, Sask., for 1911.

DAY.	April.		May.		June.	
	Gauge Height.	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			1.65	10.0	1.13	3.0
2			1.72	11.0	1.12	2.6
3			1.64	10.0	1.05	1.7
4			1.48	7.8	1.05	1.7
5	2.21	13.0	1.60	9.7	1.75	12.0
6	1.80	7.0	1.52	8.4	1.27	4.5
7	1.55	3.6	1.39	6.5	1.73	11.0
8	1.28	0.7	1.21	3.9	1.48	7.4
9	1.65	5.6	1.19	3.6	1.18	3.0
10	2.66	21.0	*1.25	4.5	1.25	3.4
11	2.47	19.0	1.31	5.4	*1.14	2.0
12			1.21	4.0	1.03	0.7
13	1.71	7.6	1.15	3.1	1.13	1.7
14	1.76	8.6	1.24	4.4	1.20	2.5
15	1.65	7.2	1.19	3.7	1.17	2.0
16	2.07	14.0	1.45	7.5	1.15	1.7
17	2.53	21.0	1.19	3.8	1.18	1.9
18	1.79	10.0	1.18	3.6	1.17	1.7
19	1.93	12.0	1.21	4.1	1.13	1.1
20	1.97	13.0	1.22	4.2	1.19	1.6
21	1.88	12.0	1.14	3.1	1.15	1.1
22	1.74	10.0	1.14	3.1	1.22	1.7
23	1.64	9.3	1.19	3.8	1.13	0.8
24	1.62	9.2	1.25	4.7	1.53	5.8
25	1.49	7.6	1.44	7.5	2.06	14.0
26	1.40	6.4	1.50	8.5	1.32	2.6
27	1.45	7.2	1.45	7.7	1.39	3.4
28	1.45	7.2	1.40	7.0	1.29	2.0
29	1.48	7.7	1.27	5.0	1.25	1.5
30	1.55	8.8	1.19	3.9	1.40	3.3
31			1.17	3.6		

SESSIONAL PAPRE No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Piapot Creek at Cumberland's Ranche, Sask., for 1911.
Continued.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.45	19 0	1 40	2 3	1 21	1 0	1 45	2.1
2.....	2 39	23 0	1 38	2 1	1 20	0 8	1 50	2 8
3.....	1.59	5 7	1 35	1 8	1 35	2 3	1 78	6.8
4.....	1 45	3 6	1 30	1 4	* 1 69	7 2	1 75	6 3
5.....	1 82	9 1	1 45	3 2	2 03	12 0	1 74	6 2
6.....	15.4	4 8	1 35	2 0	2 65	22 0	1 67	5.1
7.....	1 99	11 0	1 41	2 8	2 39	18 0	1 64	4.7
8.....	1 80	8 5	1 46	3 5	2 00	12 0	1 55	3.5
9.....	1 60	5 3	1 36	2 3	1 65	6 1	1 49	2 6
10.....	1.60	5 3	1 36	2 3	* 1 55	4 6	1 49	2 6
11.....	1 50	3 8	1 35	2 2	1 45	3 1	1 47	2.4
12.....	* 1 43	2 7	1 33	2 0	1 37	2 0	1 46	2.3
13.....	1 35	1 6	1 32	2 0	1 25	0 8	1 47	2.4
14.....	1 40	2 1	1 36	2 5	1 25	0 8	1 47	2.4
15.....	* 1.36	1 6	1 35	2 4	1 22	0 5	1 43	1.9
16.....	1 32	1 1	1 32	2 1	1 20	0 3	1 45	2.1
17.....	1 38	1 6	1 35	2 5	1 45	2 7	1 48	2.5
18.....	1 41	1 9	1 32	2 1	1 85	8 5	1 45	2.2
19.....	1 45	2 3	1 30	2 0	1 65	5 4	1 55	3.5
20.....	1 45	2 4	1 27	1 7	1.55	3 9	1 55	3.5
21.....	1 41	1 9	1 25	1 6	1 53	3 5	1 55	3.5
22.....	1 39	1 7	1 25	1 7	1 55	3 8	1 65	5.0
23.....	1.55	3 8	1 22	1 3	1.85	8 1	1.72	6.0
24.....	1 41	2 0	1 25	1 6	1.75	6 5	1.91	8.9
25.....	1 38	1 7	1 24	1 4	1 70	5 7	1 55	3.5
26.....	* 1.36	1 6	1 26	1 6	1.89	8 6	1.53	3.3
27.....	1 35	1 5	1 27	1 7	1 45	2 1	1.65	5.0
28.....	1 37	1 8	1 25	1 4	1.55	3 5	1.64	4.9
29.....	1 36	1 7	1 23	1 2	1 54	3 3	1.70	5.7
30.....	1 36	1 7	1 22	1 1	1.48	2 5	1 42	1.8
31.....	1.42	2 5	1 21	1 0			1.42	1.8

*Gauge height interpolated.

MONTHLY DISCHARGE of Piapot Creek at Cumberland's Ranche, Sask., for 1911.
(Drainage area, 50 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
April (5-30).....	21.0	0.7	9.95	0.199	0.185	493
May.....	11.0	3.1	5.71	0.114	0.131	351
June.....	14.0	0.7	3.45	0.069	0.077	205
July.....	23.0	1.1	4.46	0.089	0.103	274
August.....	3.5	1.0	1.96	0.039	0.045	121
September.....	22.0	0.8	5.39	0.107	0.119	321
October.....	8.9	1.8	3.78	0.076	0.088	232
The period.....					.748	1997

MISCELLANEOUS DISCHARGE MEASUREMENTS in Crane Lake Drainage Basin, in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. Feet.	Feet per Sec.	Sec.-Ft.
June 21.....	G. R. Elliott....	E. Branch of Bear Creek....	N.E. 29-10-23-3..	7.0	4.16	0.423	2.140
June 21.....	do	West do	N.W. 29-10-23-3.	16.0	9.04	0.444	4.010
June 20.....	do	Glennie Creek...	S.E. 25-10-24-3.				0.213 *
June 26.....	G. H. Whyte....	do	do				0.408 *
June 9.....	G. R. Elliott....	Piapot Creek....	N.E. 7-10-24-3.	11.5	11.60	0.763	8.850
April 27.....	G. H. Whyte....	Spring Creek....	Sec. 26-10-23-3.	4.9	2.29	0.420	0.960
June 22.....	G. R. Elliott....	do	N.W. 5-11-23-3.				0.408 *
June 26.....	G. H. Whyte....	do	Sec. 25-10-24-3.				0.200 *

* Weir Measurement

HAY LAKE DRAINAGE BASIN.

General Description.

Hay Lake is in Township 11, Range 25, west of the 3rd Meridian, and is fed by Hay Creek which rises in the Cypress Hills. It is a comparatively small body of saline water of an approximate area of three square miles. Like all lakes in this locality it has no outlet. The basin supplies water for a number of irrigation schemes and also to the town of Maple Creek for domestic and industrial purposes, the water being piped some nine miles, by means of a gravity system. The annual precipitation is about twelve inches, but during 1911, it was at least four inches greater; most of the rainfall occurred during May, June, July and September.

HAY CREEK AT HAY CREEK SCHOOL, SASK.

This station was established on July 4, 1910, by R. G. Swan. It is located on the S.W. ¼ Sec. 29, Tp. 10, Rge. 25, W. 3rd Mer., and is above Mr. Fauquier's ditch and below the overflow of the Maple Creek waterworks reservoir. The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the right bank of the stream. It is referred to two bench-marks as follows:—(1) a spike driven in the southeast corner of a house 300 feet west of the gauge and marked "B.M." (elev., 8.32 above the datum of the gauge); (2) a spike in the base of a willow stump, about 75 feet south of the gauge and marked "B.M." (elev., 4.96 above the datum of the gauge). The channel of the creek is slightly curved for about eight feet above and fifty feet below the gauge. The bed of the stream is sandy and covered with vegetation, which causes the point of zero flow to change slightly. The current is sluggish, and during high stages both banks, being low, are liable to overflow. Discharge measurements are made with a meter at high stages and with a weir at ordinary and low stages. During 1911, the Maple Creek waterworks were so arranged that all the overflow occurred at the intake and there was very little, if any, at the reservoir near this station as in former years. During 1911, the gauge was read by Miss A. Bornemann.

DISCHARGE MEASUREMENTS of Hay Creek at Hay Creek School, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
April 3.....	G. H. Whyte.....	4.2	1.09	0.716	0.850	0.780
June 24.....	do				0.555	0.198*
Sept. 27.....	do				0.540	0.049*

* Weir measurement.

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Hay Creek at Hay Creek School, Sask., in 1911.

DAY.	March.		April.		May.		June.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1 20	1 9	1 28	2 60	1 04	0.31
2.....			1 30	2 8	1 30	2 80	1 04	0.31
3.....			1 70	6 6	1 30	2 80	1 04	0.31
4.....			1 70	6 8	1 21	2 10	1 04	0.31
5.....			1 70	6 9	1 13	1 60	1 01	0.19
6.....			1 70	7 0	1 50	4 40	1 05	0.35
7.....			1 30	3 2	1 05	1 00	1 08	0.47
8.....			1 50	5 1	1 05	1 00	1 10	0.55
9.....			1 50	5 2	1 05	1 00	1 07	0.43
10.....			1 90	10 1	1 05	1 00	1 06	0.39
11.....			1 70	7 6	1 05	1 00	1 05	0.35
12.....			2 20	14 9	1 05	0 95	1 05	0.35
13.....			1 90	10 4	1 05	0 95	1 05	0.35
14.....			1 90	10 4	1 05	0 90	1 05	0.35
15.....			1 90	10 5	1 05	0 90	1 05	0.35
16.....			1 90	10 5	1.05	0 85	1 05	0.35
17.....			1 90	10 5	1 05	0 80	1 05	0.35
18.....			1 30	3 8	1 05	0 80	1 05	0.35
19.....			1 50	5 7	1.05	0.75	1 05	0.35
20.....			1 50	5 7	1 05	0 70	1 05	0.35
21.....			1 50	5 5	1.05	0 65	1 05	0.35
22.....			1 50	5 4	1.05	0 60	1 05	0.35
23.....			1 50	5 3	1.05	0 60	1 05	0.35
24.....	2.65	18 6	1 50	5 2	1.05	0 55	1 05	0.35
25.....	1.70	5.1	1 50	5 0	1.05	0 50	1 05	0.35
26.....	1.50	3.5	1 18	2 1	1.05	0 50	1.05	0.35
27.....	1.30	2.1	1 09	1 4	1.06	0 50	1.05	0.35
28.....	1.20	1.5	1 19	2 1	1.06	0 50	1 05	0.35
29.....	1.30	2.3	1 17	1 9	1.05	0 40	1 05	0.35
30.....	1.30	2.4	1 22	2 2	1.05	0 40	1.20	1.1
31.....	1.30	2.5			1.05	0 40		

DAILY GAUGE HEIGHT AND DISCHARGE of Hay Creek at Hay Creek School, Sask., for 1911.—*Con.*

DAY.	July.		August.		September.		October		November.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1.20	1.10			1.04	0.31	1.11	0.60	1.15	0.8
2	1.70	4.90			1.04	0.31	1.11	0.60	1.15	0.8
3	1.15	0.80			1.04	0.31	1.13	0.70	1.15	0.8
4	1.15	0.80			1.05	0.35	1.13	0.70		<i>b</i>
5	1.10	0.55			1.25	1.40	1.13	0.70		...
6	1.05	0.35			1.25	1.40	1.13	0.70		...
7	1.05	0.35			1.25	1.40	1.13	0.70		...
8	1.05	0.35			1.20	1.10	1.00	0.51		...
9					1.15	0.80	1.09	0.51		...
10					1.10	0.55	1.09	0.51		...
11					1.07	0.43	1.09	0.51		...
12					1.07	0.43	1.09	0.51		...
13					1.07	0.43	1.00	0.51		...
14			1.05	0.35	1.07	0.43	1.09	0.51		...
15			1.05	0.35	1.07	0.43	1.07	0.43		...
16			1.05	0.35	1.07	0.43	1.07	0.43		...
17			1.05	0.35	1.07	0.43	1.07	0.43		...
18			1.05	0.35	1.07	0.43	1.07	0.43		...
19			1.05	0.35	1.07	0.43	1.07	0.43		...
20			1.05	0.35	1.07	0.43	1.07	0.43		...
21			1.05	0.35	1.11	0.60	1.07	0.43		...
22			1.05	0.35	1.11	0.60	1.07	0.43		...
23			1.05	0.35	1.11	0.60	1.15	0.80		...
24			1.05	0.35	1.11	0.60	1.15	0.80		...
25			1.05	0.35	1.11	0.60	1.15	0.80		...
26			1.05	0.35	1.11	0.60	1.15	0.80		...
27			1.04	0.31	1.11	0.60	1.15	0.80		...
28			1.04	0.31	1.11	0.60	1.15	0.80		...
29			1.04	0.31	1.11	0.60	1.15	0.80		...
30			1.04	0.31	1.11	0.60	1.15	0.80		...
31			1.04	0.31			1.15	0.80		...

a to *a* No observations made.
b Creek frozen.

MONTHLY DISCHARGE of Hay Creek at Hay Creek School, Sask., for 1911.
(Drainage area, 30 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (24-31).....	18.6	1.50	4.750	0.158	0.047	75.4
April.....	14.9	1.40	6.060	0.202	0.225	361.0
May.....	4.4	0.40	1.110	0.037	0.043	68.0
June.....	1.1	0.19	0.379	0.013	0.014	22.6
July (1-8).....	4.9	0.35	1.150	0.038	0.011	18.0
August (14-31).....	0.35	0.31	0.038	0.011	0.007	12.0
September.....	1.4	0.31	0.608	0.020	0.022	36.0
October.....	0.8	0.43	0.610	0.020	0.023	37.5
November (1-3).....	0.8	0.80	0.800	0.027	0.003	4.8
The period.....					.395	635.3

HAY CREEK AT FAUQUIER'S RANCHE, SASK.

This station was established on April 22, 1909, by F. T. Fletcher. It is located on the N.E. 1/4 Sec. 30, Tp. 10, Rge. 25, W. 3rd Mer., about seven miles southeast of Maple Creek. It is situated below the intake of H. Fauquier's irrigation ditch, and also below the intake of the Maple Creek waterworks. Hence, records of flow obtained at this station do not represent the total discharge of the stream. The flow of springs below the Maple Creek waterworks intake,

SESSIONAL PAPER No. 25d

together with drainage, and the overflow from the Maple Creek waterworks give a continuous flow in the creek above the station. This flow, which is very largely the overflow from the Maple Creek waterworks, varies greatly, depending upon the consumption of water by the town of Maple Creek and by the Canadian Pacific Railway. The disappearance of water before reaching this station is explained, in part, by the fact that Mr. Fauquier diverts water into his irrigation ditch. The remainder of the water must seep through the gravel of the creek-bed before it reaches this station. The fact that springs break out a short distance below the gauge and give a continuous flow (so far as is known) seems to bear out the seepage theory.

The channel is straight for 100 feet above and 200 feet below the station. Both banks are high and not liable to overflow. The bed of the stream is composed of sand and coarse gravel, and is liable to shift at high stages. The current is sluggish during low water, but is very swift at high stages.

Discharge measurements are made near the gauge by wading and at very low stages a weir is used. The initial point for soundings is a square stake driven close to the ground on the left bank, marked "I.P."

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the left bank. It is referred to bench-marks as follows:—(1) a spike-head in the top of the initial-point stake on the left bank (elev., 6.62 feet above the zero of the gauge); (2) a "broad-arrow" marked with red paint on a large rock in the foundation of a frame out-building close to the gauge (elev., 9.34 feet above the zero of the gauge).

During 1911, the gauge was read by Mr. H. Fauquier.

DISCHARGE MEASUREMENTS of Hay Creek at Fauquier's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 24.....	G. H. Whyte.....	8.0	11.75	1.58	2.65	18.53
April 26.....	do	5.0	3.35	0.61	1.18	2.04
May 31.....	do				1.04	0.487*
July 19.....	do				1.03	0.294*
Aug. 21.....	do				1.06	0.323*

* Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Hay Creek at Fauquier's Ranche, Sask., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			.7	0.37	0.70	0.37	0.51	0.06
2			Frozen	.....	0.98	1.27	0.50	0.05
3			"	.....	1.00	1.37	0.50	0.05
4			"		0.96	1.19	0.51	0.06
5			0.70	0.37	0.86	0.81	0.65	0.27
6			0.70	0.37	0.69	0.35	0.56	0.13
7			0.70	0.37	0.60	0.18	0.60	0.18
8			0.80	0.62	0.57	0.14	1.11	2.00
9			1.20	2.5	0.55	0.11	0.58	0.15
10			1.50	4.7	0.56	0.13	0.55	0.11
11			1.20	2.5	0.55	0.11	0.58	0.15
12			Frozen	.....	0.57	0.14	0.53	0.09
13			0.70	0.37	0.57	0.14	0.51	0.06
14			0.70	0.37	0.57	0.14	0.53	0.09
15			1.00	1.37	0.57	0.14	0.52	0.07
16			1.20	2.5	0.86	0.81	0.48	0.03
17			1.30	3.2	0.59	0.17	0.41	Nil.
18			0.90	0.95	0.55	0.11	Dry.	"
19			1.10	1.9	0.56	0.13	"	"
20			1.00	1.37	0.53	0.09	"	"
21			1.00	1.37	0.55	0.11	"	"
22	1.2	2.50	1.20	2.5	0.55	0.11	"	"
23	1.2	2.50	1.00	1.37	0.60	0.18	"	"
24	1.6	5.50	1.00	1.37	0.60	0.18	"	"
25	1.3	3.20	1.00	1.37	0.63	0.23	0.60	0.18
26	1.0	1.37	0.90	0.95	0.60	0.18	0.60	0.18
27	0.8	0.62	0.68	0.33	0.62	0.21	0.56	0.11
28	1.2	2.50	0.69	0.35	0.59	0.17	0.56	0.11
29	1.1	1.90	0.70	0.37	0.57	0.14	0.49	0.04
30	0.8	0.62	0.70	0.37	0.54	0.10	0.55	0.11
31	0.7	0.37			0.54	0.10		

DAILY GAUGE HEIGHT AND DISCHARGE of Hay Creek at Fauquier's Ranche, Sask., for 1911.—*Con.*

DAY.	July.		August.		September.		October.		November.	
	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.75	0.49	Dry	Nil	Dry	Nil	0.49	0.04	0.70	0.37
2.....	1.40	3.9	"	"	"	"	0.54	0.10	0.71	0.39
3.....	0.72	0.41	"	"	"	"	0.61	0.19	0.70	0.37
4.....	0.60	0.18	"	"	0.58	0.15	0.63	0.23	0.69	0.35
5.....	0.62	0.21	0.52	0.07	0.63	0.23	0.55	0.11	0.60	0.18
6.....	0.55	0.11	0.50	0.05	0.82	0.68	0.54	0.10	0.59	0.17
7.....	0.53	0.09	0.60	0.18	0.87	0.84	0.52	0.07	Frozen	.....
8.....	0.53	0.09	0.55	0.11	0.58	0.15	0.52	0.07	.....	.....
9.....	0.55	0.11	0.54	0.10	0.54	0.10	0.53	0.09	.....	.....
10.....	0.52	0.07	0.50	0.05	0.53	0.09	0.51	0.06	.....	.....
11.....	0.50	0.05	0.49	0.04	0.50	0.05	0.53	0.09	.....	.....
12.....	0.50	0.05	0.45	0.01	0.48	0.03	0.54	0.10	.....	.....
13.....	0.49	0.04	Dry	Nil	0.50	0.05	0.53	0.09	.....	.....
14.....	0.40	Nil	"	"	0.54	0.10	0.50	0.05	.....	.....
15.....	Dry	"	"	"	0.51	0.06	0.52	0.07	.....	.....
16.....	"	"	"	"	Dry	Nil	0.58	0.15	.....	.....
17.....	"	"	"	"	0.45	0.01	0.58	0.15	.....	.....
18.....	"	"	"	"	0.55	0.11	0.60	0.18	.....	.....
19.....	"	"	"	"	0.53	0.09	0.55	0.11	.....	.....
20.....	"	"	"	"	0.51	0.06	0.57	0.14	.....	.....
21.....	"	"	"	"	0.48	0.03	0.55	0.11	.....	.....
22.....	"	"	"	"	0.52	0.07	0.54	0.10	.....	.....
23.....	"	"	"	"	0.56	0.13	0.57	0.14	.....	.....
24.....	"	"	"	"	0.60	0.18	0.60	0.18	.....	.....
25.....	"	"	"	"	0.55	0.11	0.61	0.19	.....	.....
26.....	"	"	"	"	0.54	0.10	0.62	0.21	.....	.....
27.....	"	"	"	"	0.54	0.10	0.63	0.23	.....	.....
28.....	"	"	"	"	0.53	0.09	0.63	0.23	.....	.....
29.....	"	"	"	"	0.52	0.07	0.62	0.21	.....	.....
30.....	"	"	"	"	0.50	0.05	0.63	0.23	.....	.....
31.....	"	"	"	"	.....	.....	0.68	0.23	.....	.....

MONTHLY DISCHARGE of Hay Creek at Fauquier's Ranche, Sask., for 1911.
(Drainage area, 32 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean. •	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-Feet.
March (22-31).....	5.50	0.37	2.110	0.066	0.024	42
April.....	4.70	0.33	1.140	0.036	0.040	63
May.....	1.37	0.10	0.310	0.010	0.012	19
June.....	2.00	0.00	0.142	0.004	0.004	8
July.....	3.90	0.00	0.187	0.006	0.007	12
August.....	0.18	0.00	0.020	0.001	0.001	1
September.....	0.84	0.00	0.120	0.004	0.004	7
October.....	0.33	0.04	0.140	0.004	0.005	9
November (1-6).....	0.39	0.17	0.305	0.009	0.002	4
The period.....	.....	.....	.....	.....	0.099	170

MISCELLANEOUS DISCHARGE MEASUREMENTS of Hay Lake Drainage Basin, in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of	Mean	Discharge.
				Feet.	Sq. Feet.		
						Velocity.	
						Feet per	Sec.-Ft.
						Sec.	
June 12.	G. R. Elliott.	Hay Creek Br. of	S. E. 16-10-25-3	*			0.600
do	do	do	N.W. 3-10-25-3	*			0.150
do	do	Spring.	N.W. 10-10-25-3	*			0.106
do	do	do	N.E. 3-10-25-3	*			0.213

* Weir measurement.

BIG STICK LAKE DRAINAGE BASIN.

General Description.

This lake is one of the largest in the northern Cypress Hills district. It is situated in township 15, range 25, west of the third meridian, covers an area of 35 square miles, is alkaline in character, and has no outlet.

Maple Creek, which rises in the Cypress Hills, with its tributary, Gap Creek, is its only source of supply. On the south and east the lake is bounded by the sandhills. The drainage area is 820 square miles.

The valley of Maple Creek is quite flat and shallow, and the surrounding bench-land is gently rolling prairie.

The annual precipitation is about twelve inches, and most of it falls during May, June and July.

There are several small irrigation ditches in the basin.

MAPLE CREEK AT MAPLE CREEK, SASK.

This station was established May 9, 1908, by R. J. Burley. It is located at the highway bridge just north of the Canadian Pacific Railway tracks in the town of Maple Creek, on the road allowance east of the N.E. ¼ Sec. 16, Tp. 11, Rge. 16, W. 3rd Mer.

The channel is straight for 200 feet above and 100 feet below the station. Both banks are comparatively low, and will overflow at high-water stages of the stream. The bed of the stream is composed of sand, and may shift during flood stages. The current is moderate at high and sluggish at low stages of the stream.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a pile on the upstream side of the bridge. The zero is referred to a permanent iron benchmark located on the right bank and on the west side of the road allowance.

Discharge measurements are made from the downstream side of the bridge. The initial point for sounding is the inner face of the right, or south, abutment of the bridge. Low-water measurements are made at a point about fifty feet upstream from the gauge by wading, and at very low stages a weir is used. The light, sandy soil of the banks gives rise to a great amount of erosion during flood stages, and this fact, coupled with that of the low banks of the stream, makes this station a rather unsatisfactory one for gauging purposes. The bridge is not at right angles to the flow and measurements made from the bridge must be corrected.

The gauge was read daily by R. G. Williamson, from March 23 to June 23, and by Tom Williams from July 27 to November 4.

DISCHARGE MEASUREMENTS of Maple Creek at Maple Creek, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of	Mean	Gauge	Discharge.
			Section.	Velocity.	Height.	
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 23.	G. H. Whyte.	38.0	78.07	0.734	2.950	57.28
Mar. 25.	do	40.9	121.20	0.965	3.800	116.90
April 13.	M. H. French.	33.0	54.15	0.510	2.185	27.59
April 22.	G. H. Whyte.	37.9	61.44	0.532	2.225	32.71
May 5.	M. H. French.	38.0	55.70	0.297	1.940	16.59†
May 5	do	38.0	55.70	0.328	1.930	18.28‡
May 5	do	38.0	55.70	0.357	1.920	19.90*
May 29.	do	33.0	37.05	0.177	1.520	6.59
June 23.	do	19.0	16.10	0.003	0.710	0.05*
Aug. 18.	do				0.300	Nil.
Sept. 11.	do	30.0	27.30	0.063	1.140	1.71
Oct. 16.	do	20.0	18.90	0.008	0.740	0.15*

* Weir measurement.
† Gauging made at a poor cross-section upstream, with meter of pattern No. 623.
‡ Gauging made at the same cross-section with meter of pattern No. 618.
* Gauging made at the same cross-section with meter of pattern No. 600.

DAILY GAUGE HEIGHT AND DISCHARGE of Maple Creek at Maple Creek, Sask., for 1911.

DAY	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1 ..			2 00	15.0	1 75	12.0	1 50	7.0
2 ..			1 80	11.0	1 75	12.0	1 49	6.8
3 ..			1 60	6.5	1 75	12.0	1 48	6.6
4 ..			1 30	3.0	1 75	12.0	1 46	6.2
5 ..			1 30	2.8	1 75	12.0	1 46	6.2
6 ..			1 70	9.5	1 75	12.0	1 45	6.0
7 ..			2 00	18.0	1 75	12.0	1 44	5.8
8 ..			2 80	50.0	1 75	12.0	1 87	16.0
9 ..			3 10	19.0	1 75	12.0	1 87	16.0
10 ..			4 25	182.0	1 75	12.0	1 87	16.0
11 ..			4 75	246.0	1 70	11.0	1 70	11.0
12 ..			3 70	129.0	1 70	11.0	1 55	8.0
13 ..			2 15	26.0	1 80	14.0	1 45	6.0
14 ..			2 30	34.0	1 60	9.0	1 40	5.0
15 ..			2 24	31.0	1 50	7.0	1 36	4.6
16 ..			6 80	34.0	1 40	5.0	1 00	1.3
17 ..			2 30	34.0	1 40	5.0	0 90	0.8
18 ..			4 05	164.0	1 30	4.0	0 70	0.1
19 ..			2 45	42.0	1 30	4.0	0 70	0.1
20 ..			2 10	24.0	1 25	3.5	0 70	0.1
21 ..			2 30	34.0	1 25	3.5	0 70	0.1
22 ..			2 16	27.0	1 25	3.5	0 70	0.1
23 ..	3.40	87.0	2 37	38.0	1 55	8.0	0 71	0.1
24 ..	3.41	87.0	2 20	29.0	1 55	8.0		
25 ..	3.69	108.0	2 00	20.0	1 55	8.0		
26 ..	2.90	53.0	1 90	17.0	1 55	8.0		
27 ..	2.52	33.0	1 70	11.0	1 55	8.0		
28 ..	2.28	23.0	1 60	9.0	1 55	8.0		
29 ..	2.40	29.0	1 70	11.0	1 55	8.0		
30 ..	2.32	25.0	1 70	11.0	1 52	7.4		
31 ..	2.26	24.0			1 50	7.0		

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Maple Creek at Maple Creek, Sask., for 1911.—*Con.*

DAY.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1 ...			0.44	Nil	0.15	Nil	0.89	0.8	0.97	1.2
2....			0.43	"	0.14	"	0.86	0.6	0.99	1.2
3...			0.41	"	0.19	"	0.84	0.6	0.94	1.0
4.....			0.40	"	0.31	"	0.82	0.5	0.91	0.8
5...			0.38	"	0.47	"	0.90	0.8		...
6...			0.38	"	0.64	"	0.97	1.2		...
7...			0.37	"	0.87	0.7	1.19	2.9		...
8...			0.36	"	1.45	6.0	1.19	2.9		...
9.....			0.36	"	1.32	4.2	1.12	2.2		...
10...			0.34	"	1.20	3.0	0.96	1.1		...
11 ..			0.34	"	1.14	2.4	0.96	1.1		...
12 ..			0.34	"	0.94	1.0	0.92	0.9		...
13...			0.33	"	0.87	0.7	0.82	0.5		...
14...			0.33	"	0.74	0.2	0.74	0.2		...
15...			0.31	"	0.66	0.1	0.74	0.2		...
16...			0.30	"	0.66	0.1	0.74	0.2		...
17...			0.29	"	0.66	0.1	0.74	0.2		...
18...			0.29	"	0.66	0.1	0.74	0.2		...
19...			0.28	"	0.66	0.1	0.78	0.3		...
20.....			0.26	"	0.66	0.1	0.87	0.7		...
21....			0.18	"	0.66	0.1	0.87	0.7		...
22.....			0.17	"	0.66	0.1	0.88	0.7		...
23.....			0.17	"	0.66	0.1	0.90	0.8		...
24....			0.17	"	0.66	0.1	1.21	3.1		...
25.....			0.17	"	0.66	0.1	1.27	3.7		...
26 ..			0.17	"	0.86	0.6	1.20	3.0		...
27.....	0.59	Nil	0.17	"	1.16	2.6	1.10	2.0		...
28.....	0.56	"	0.17	"	1.10	2.0	1.07	1.8		...
29...	0.54	"	0.17	"	0.92	0.9	1.01	1.4		...
30.....	0.48	"	0.17	"	0.92	0.9	0.90	0.8		...
31.....	0.45	"	0.16	"		...	0.96	1.1		...

NOTE.—The records for March, April, May, and June are only approximate as the observer was either incompetent or careless and did not perform his duties satisfactorily. There were no observations from June 24 to July 26, but there was considerable rain during the last few days of June, and the run-off during the period of no observations is estimated at 370 acre-feet.

MONTHLY DISCHARGE of Maple Creek at Maple Creek, Sask., for 1911.

(Drainage area, 87 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (23-31).....	108.0	23.0	52.1	0.599	0.200	930.
April.....	246.0	2.8	45.2	0.520	0.580	2,690.
May.....	14.0	3.5	8.7	0.100	0.115	535.
June (1-23).....	16.0	0.1	5.6	0.064	0.055	258.
July (27-31).....	00.0	0.0	0.0	0.000	0.000	00.
August.....	00.0	0.0	0.0	0.000	0.000	00.
September.....	6.0	0.0	0.9	0.010	0.011	54.
October.....	3.7	0.2	1.2	0.138	0.159	74.
November (1-4).....	1.2	0.8	1.0	0.011	0.012	8.
The period					1.132	4549

NOTE.—The records for March, April, May, and June are only approximate. Run-off from June 24 to July 26 is estimated at 370 acre-feet.

MAPLE CREEK NEAR MAPLE CREEK, SASK.

This station was established on May 4, 1910, by H. R. Carscallen. It is one mile north of the town of Maple Creek, on the bridge between Secs. 27 and 28, Tp. 11, Rge. 16, W. 3rd Mer.

The channel is straight for a distance of 100 feet upstream and 10 feet down-stream. The right bank is high and sandy. The left is low, with a gradual slope, and is liable to overflow. The stream is sandy and liable to shift.

The gauge, which is a plain staff graduated to feet and hundredths, is securely fastened to the downstream side of the second pile from the right abutment. It is referred to two bench marks, viz.: (1) two spikes in the downstream side of the plank wing at the right abutment, marked "B.M." (elevation, 9.37); (2) a spike-head in a five-inch post on the right bank, 35 feet west of the gauge and marked "B.M." (elevation, 9.42).

Because of apparent inaccuracies in observations, the gauge-height records for 1911 are not considered satisfactory and have not been used. There is, therefore, no table of daily gauge-height and discharge for 1911.

DISCHARGE MEASUREMENTS of Maple Creek near Maple Creek, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 25.....	G. H. Whyte.....	40.0	72.25	1.118	5.250	80.750*
Mar. 31.....	do.....	27.5	51.77	0.451	3.695	23.338†
April 22.....	do.....	26.6	20.26	1.392	3.740	28.440
May 5.....	M. H. French.....	30.0	56.51	0.102	3.520	15.930
May 30.....	do.....	29.0	41.81	0.102	3.010	4.280
June 22.....	do.....	27.0	31.06	0.008	2.700	0.270‡
July 17.....	G. H. Whyte.....				2.680	0.353‡

* Anchor drift ice and snow.
† Floating ice.
‡ Weir measurement.

WHITE DITCH NEAR CYPRESS, SASK.

This station was established on June 15, 1911, by W. A. Fletcher. It is located in the S.W. ¼ Sec. 1, Tp. 9, Rge. 27, W. 3rd Mer.

The gauge, which consists of a board divided into feet and inches, is nailed to a stake driven in the ditch. The zero of the gauge is referred to the top of a stump on the left bank and upstream from the gauge.

Discharge measurements are made with a weir.

GAP CREEK AT SMALL'S RANCHE, SASK.

This station was established April 25, 1909, by F. T. Fletcher. It is located on the S.E. ¼ Sec. 4, Tp. 10, Rge. 27, W. 3rd Mer., about 400 yards west of the surveyed trail from Maple Creek to Tenmile and about 12 miles south of Maple Creek.

The channel is straight for 60 feet above and 500 feet below the station. The right bank is high, and will not overflow except at very extreme flood stages; the left bank is much higher than the right, and will not overflow at any stage of the stream. The bed of the stream is composed of loose, coarse gravel. The current is sluggish.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked firmly to a vertical post sunk in the bed of the stream at the right bank and securely stayed to the bank. The zero (elev., 66.62) is referred to a permanent iron bench-mark (assumed elev., 100.00), near the McShane Creek bridge, and about 1,000 feet south of the gauge.

Discharge measurements are made at ordinary stages with a current-meter by wading, and from a cable-car at high stages. The initial point for soundings is a seven-eighths inch iron pin on the right bank. It stands about four inches above ground and is protected by a mound of stones. It is also about three feet west of the northwest corner of a log building used as a cattle shed.

During 1911, the gauge was read by William Small.

There are a few small irrigation ditches in course of construction above this station, but during 1911 little or no water was diverted.

SESSIONAL PAPER No. 25d

DISCHARGE MEASUREMENTS of Gap Creek at Small's Ranche, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 14.....	M. H. French.....	24.0	28.74	0.780	2.47	22.31
May 8.....	do.....	44.0	24.20	0.238	2.25	5.78
June 1.....	do.....	22.0	19.40	0.074	2.14	1.43*
June 26.....	do.....	34.0	47.10	1.230	2.81	58.10
July 29.....	do.....					Nil.
Aug. 18.....	do.....		16.10		1.90	Nil.
Aug. 21.....	do.....		16.10		1.90	Nil.
Sept. 9.....	do.....	29.0	29.55	0.895	2.55	26.46

* Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Gap Creek at Small's Ranche, Sask., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec. ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.40	15.0	2.72	46.0	2.14	1.8
2.....			2.30	8.8	2.70	44.0	2.10	0.9
3.....			2.23	5.1	2.65	38.0	2.08	0.7
4.....			2.24	5.6	2.70	44.0	2.06	0.4
5.....			2.25	6.0	2.55	28.0	2.06	0.4
6.....			2.24	5.6	2.42	17.0	2.05	0.3
7.....			2.20	3.8	2.36	12.4	2.11	1.1
8.....			2.25	6.0	2.30	8.8	2.23	5.1
9.....			2.65	† 38.0	2.22	4.7	2.23	5.1
10.....			3.25	† 146.0	2.19	3.4	2.21	4.2
11.....			3.40	† 181.0	2.21	4.2	2.14	1.8
12.....			2.46	20.0	2.23	5.1	2.10	0.9
13.....			2.40	15.0	2.25	6.0	2.06	0.4
14.....			2.40	15.0	2.18	3.1	2.02	0.1
15.....			2.81	58.0	2.15	2.0	2.00	Nil.
16.....			2.95	81.0	2.18	3.1	1.97	"
17.....	2.98*		3.08	107.0	2.30	8.8	1.95	"
18.....	3.09*		2.80	57.0	2.30	8.8	1.94	"
19.....	3.04*		2.83	61.0	2.25	6.0	1.92	"
20.....	3.49*		2.73	48.0	2.19	3.4	1.93	"
21.....	3.64*		2.70	44.0	2.18	3.1	2.30	8.8
22.....	2.84	63.0	2.77	53.0	2.15	2.0	2.18	3.1
23.....	2.75	50.0	2.71	45.0	2.20	3.8	2.21	4.2
24.....	3.25	146.0	2.48	21.0	2.35	11.8	2.15	2.0
25.....	2.89	70.0	2.53	26.0	2.35	11.8	2.17	2.7
26.....	2.63	36.0	2.46	20.0	2.35	11.8	2.84	† 63.0
27.....	2.65	38.0	2.40	15.0	2.40	15.0	2.35	† 11.8
28.....	2.71	45.0	2.38	13.7	2.34	11.2	2.26	6.6
29.....	2.74	49.0	2.40	15.0	2.27	7.2	2.20	3.8
30.....	2.74	49.0	2.50	23.0	2.20	3.8	2.15	2.0
31.....	2.47	21.0			2.19	3.4		

DAILY GAUGE HEIGHT AND DISCHARGE of Gap Creek at Small's Rancho, Sask., for 1911. *Con.*

DAY.	July.		August.		September		October.		November.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2 45	19 0	1 89	Nil	1 84	Nil	2 17	2 7	2 18	3 1
2.	3 16	†125 0	1 88	"	1 84	"	2 15	2 0	2 14	1 8
3.	2 50	23 0	1 88	"	1 85	"	2 18	3 1	2 12	1 3
4.	2 34	11 2	1 87	"	2 00	"	2 50	23 0	2 20	3 8
5.	2 34	11 2	1 91	"	3 80	‡280 0	2 40	15 0	2 23	5 1
6.	2 34	11 2	1 94	"	5 26	†645 0	2 30	8 8	2 25	6 0
7.	2 23	5 1	1 95	"	3 53	‡212 0	2 25	6 0	2 20	3 8
8.	2 14	1 8	2 20	3 8	2 77	53 0	2 20	3 8	2 18	3 1
9.	2 10	0 9	2 37	13 0	2 56	29 0	2 16	2 4	2 18	3 1
10.	2 10	0 9	2 23	5 1	2 44	18 0	2 16	2 4	2 18	3 1
11.	2 07	0 5	2 14	1 8	2 36	12 4	2 14	1 8	2 18	3 1
12.	2 05	0 3	2 08	0 7	2 30	8 8	2 12	1 3	2 18	3 1
13.	2 01	0 1	2 02	0 1	2 26	6 6	2 10	0 9	2 18	3 1
14.	2 00	Nil	1 99	Nil	2 23	5 1	2 10	0 9	2 18	3 1
15.	2 00	"	1 95	"	2 19	3 4	2 10	0 9	2 18	3 1
16.	1 98	"	1 94	"	2 15	2 0	2 10	0 9		
17.	1 96	"	1 93	"	2 15	2 0	2 10	0 9		
18.	1 96	"	1 92	"	2 15	2 0	2 10	0 9		
19.	1 96	"	1 91	"	2 14	1 8	2 12	1 3		
20.	1 95	"	1 91	"	2 14	1 8	2 15	2 0		
21.	1 95	"	1 90	"	2 15	2 0	2 17	2 7		
22.	1 94	"	1 89	"	2 16	2 4	2 17	2 7		
23.	1 93	"	1 89	"	2 18	3 1	2 25	6 0		
24.	1 92	"	1 88	"	2 34	11 2	2 31	9 4		
25.	1 91	"	1 88	"	2 37	13 0	2 32	10 0		
26.	1 90	"	1 90	"	2 39	14 0	2 24	5 6		
27.	1 88	"	1 90	"	2 32	10 0	2 20	3 8		
28.	1 88	"	1 87	"	2 25	6 0	2 20	3 8		
29.	1 87	"	1 86	"	2 23	5 1	2 20	3 8		
30.	1 87	"	1 85	"	2 20	3 8	2 20	3 8		
31.	1 89	"	1 85	"			2 18	3 1		

* Ice in stream. Not sufficient data to compute the discharge.
† Spring freshet.
‡ Heavy rain.

MONTHLY DISCHARGE of Gap Creek at Small's Rancho, for 1911.

(Drainage area, 129 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
March (22-31).....	146.0	21.0	56.7	0 440	0.164	1,125.
April.....	181.0	3.8	38.6	0.299	0.334	2,297.
May.....	46.0	2.0	12.3	0.095	0.110	756.
June.....	63.0	0.0	4.4	0.034	0.038	262.
July.....	125.0	0.0	6 8	0.053	0.061	418.
August.....	13.0	0.0	0 8	0.006	0.007	49.
September.....	645.0	0.0	45.1	0.350	0.390	2,684.
October.....	23.0	0.9	4.4	0.034	0.039	270.
November (1-15).....	6.0	1.3	3.3	0.026	0.014	99.
The period.....					1 157	7,960.

McSHANE CREEK AT SMALL'S RANCHE, SASK.

This station was established April 23, 1909, by F. T. Fletcher. It is located on the S.W. ¼ Sec. 3, Tp. 10, Rge. 27, W. 3rd Mer., at the highway bridge on the surveyed trail from Maple Creek to Tenmile, about 12 miles south of Maple Creek. It is about 600 feet above the mouth

SESSIONAL PAPER No. 25d

of the creek and about 500 feet from Wm. Small's house. Mr. Small diverts water from the stream for irrigation purposes, and as the intake of his ditch is above the station, records of daily flow do not represent the full discharge of the creek when water is being used in the ditch.

The channel is straight for 100 feet above and 200 feet below the station. Both banks are high and not liable to overflow. The bed of the stream is composed of coarse gravel, and shifts at high stages. The current is swift.

The gauge, which is a plain staff graduated to feet and hundredths, is attached firmly to the right abutment on the downstream side of the bridge. The zero of the gauge (elev., 85.71) is referred to a permanent iron bench-mark (assumed elev., 100.00), located just east of the bridge upon the north side of the diversion of the road allowance. It stands about four inches above ground and is protected by stones.

High-water measurements are made from the downstream side of the bridge. The initial point for soundings is the inner face of the right abutment of the bridge. Low-water measurements are made near the gauge by wading and at very low stages a weir is used.

During 1911, the gauge was read by William Small.

DISCHARGE MEASUREMENTS of McShane Creek at Small's Rancho, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Ap 15.	M. H. French.....	14.5	5.24	0.437	0.79	2.283
July 29	do					Nil.
Aug. 18	do					Nil.
Sept 10	do				0.45	Nil.*

* Small seepage through gravel.

DAILY GAUGE HEIGHT AND DISCHARGE of McShane Creek at Small's Rancho, Sask., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.			0.57	0.6	0.82	2.7	Dry.	Nil
2.			0.14	Nil	0.83	2.8	"	"
3.			Nil	"	0.75	1.9	"	"
4.			"	"	0.75	1.9	"	"
5.			"	"	0.65	1.0	"	"
6.			"	"	0.55	0.4	"	"
7.			"	"	0.55	0.4	"	"
8.			0.61	0.8	0.06	Nil	0.80	2.5
9.			1.05	6.6	Dry	"	0.63	0.9
10.			0.91	3.9	"	"	0.23	Nil
11.			0.87	3.3	"	"	Dry	"
12.			0.57	0.6	0.56	0.5	"	"
13.			0.50	0.2	0.10	Nil	"	"
14.			0.57	0.6	Dry.	"	"	"
15.			0.78	2.2	"	"	"	"
16.			0.90	3.7	"	"	"	"
17.	1.13	8.5	0.90	3.7	0.72	1.6	"	"
18.	0.94	4.4	0.80	2.4	0.49	0.2	"	"
19.	1.02	5.9	0.85	3.0	Dry	Nil	"	"
20.	1.14	8.7	0.80	2.4	"	"	"	"
21.	1.07	7.0	0.84	2.9	"	"	"	"
22.	0.90	3.7	0.85	3.0	"	"	"	"
23.	0.93	4.2	0.82	2.7	0.72	1.6	"	"
24.	0.98	5.1	0.75	1.9	0.65	1.0	"	"
25.	0.85	3.0	0.74	1.8	0.70	1.4	"	"
26.	0.73	1.7	0.72	1.6	0.70	1.4	"	"
27.	0.68	1.3	0.65	1.0	0.69	1.3	"	"
28.	0.76	2.0	0.62	0.8	0.60	0.7	"	"
29.	0.80	2.4	0.85	3.0	0.55	0.4	"	"
30.	0.84	2.9	0.73	1.7	Dry	Nil	"	"
31.	0.76	2.0			"	"	"	"

DAILY GAUGE HEIGHT AND DISCHARGE of McShane Creek at Small's Ranche, Sask., for 1911.—
Continued.

DAY.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.03	6.2	Dry	Nil	Dry	Nil	Dry	Nil	Dry	Nil
2.....	1.02	5.9	"	"	"	"	"	"	"	"
3.....	0.74	1.8	"	"	"	"	"	"	"	"
4.....	0.65	1.0	"	"	"	"	0.85	3.0	"	"
5.....	0.70	1.4	"	"	1.00	5.5	0.70	1.4	"	"
6.....	0.53	0.4	"	"	1.35	14.0	0.52	0.3	"	"
7.....	Dry	Nil	"	"	0.90	3.7	Dry	Nil	"	"
8.....	"	"	0.84	2.9	0.74	1.8	"	"	"	"
9.....	"	"	0.57	0.6	0.72	1.6	"	"	"	"
10.....	"	"	Dry	"	0.26	Nil	"	"	"	"
11.....	"	"	"	"	Dry	"	"	"	"	"
12.....	"	"	"	"	"	"	"	"	"	"
13.....	"	"	"	"	"	"	"	"	"	"
14.....	"	"	"	"	"	"	"	"	"	"
15.....	"	"	"	"	"	"	"	"	"	"
16.....	"	"	"	"	"	"	"	"	"	"
17.....	"	"	"	"	"	"	"	"	"	"
18.....	"	"	"	"	"	"	"	"	"	"
19.....	"	"	"	"	"	"	"	"	"	"
20.....	"	"	"	"	"	"	"	"	"	"
21.....	"	"	"	"	"	"	"	"	"	"
22.....	"	"	"	"	"	"	"	"	"	"
23.....	"	"	"	"	"	"	"	"	"	"
24.....	"	"	"	"	0.84	2.9	"	"	"	"
25.....	"	"	"	"	0.74	1.8	0.72	1.6	"	"
26.....	"	"	"	"	0.70	1.4	0.60	0.7	"	"
27.....	"	"	"	"	0.35	Nil	Dry	Nil	"	"
28.....	"	"	"	"	Dry	"	"	"	"	"
29.....	"	"	"	"	"	"	"	"	"	"
30.....	"	"	"	"	"	"	"	"	"	"
31.....	"	"	"	"	"	"	"	"	"	"

MONTHLY DISCHARGE of McShane Creek at Small's Ranche, Sask., for 1911.
(Drainage area, 24 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (17-31).....	8.7	1.3	4.2	0.175	0.098	125.
April.....	6.6	0.0	1.8	0.075	0.084	107.
May.....	2.8	0.0	0.7	0.029	0.033	43.
June.....	2.5	0.0	0.1	0.004	0.004	6.
July.....	6.2	0.0	0.5	0.021	0.024	31.
August.....	2.9	0.0	0.1	0.004	0.005	6.
September.....	14.0	0.0	1.1	0.005	0.006	68.
October.....	3.0	0.0	0.2	0.008	0.009	18.
November (1-15).....	0.0	0.0	0.0	0.000	0.000	00.
The period.....					0.263	402.

NOTE.—To the above must be added the water diverted by William Small's irrigation ditch which took a large percentage of the year's run-off. There is a small flow near the head of the creek all summer, but it disappears in the gravel, evaporates, or is diverted by ditches, and the creek is dry almost all summer at the gauging station.

GAP CREEK NEAR MAPLE CREEK, SASK.

This station was established on May 3, 1910, by H. R. Carscallen. It is located at the traffic bridge on the road allowance between Sec. 31 and 32, Tp. 11, Rge. 26, W. 3rd Mer., which is about four and a half miles north of the town of Maple Creek.

The channel is straight for about 60 feet above the station, but is slightly curved for about 100 feet below. The left bank is high and the right low, but the stream is not liable to overflow. The bed is sandy, and shifts during flood stages of the stream.

During high water, discharge measurements are made from the bridge, and during ordinary stages by wading. The initial point for soundings is marked on the north end of the bridge in red paint. The bridge is not at right angles to the direction of the current, and a co-efficient is applied to the measured discharge to obtain the actual discharge. The discharge is determined in extreme low water by means of a weir.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the downstream end of the south pier of the bridge. It is referred to a point marked "B.M." in red paint on the top of the cap of the left abutment (elevation, 13.48 above zero).

During 1911, the gauge was read by R. B. Williamson.

DISCHARGE MEASUREMENTS of Gap Creek near Maple Creek, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 23.....	G. H. Whyte.....	29.7	43.71	1.796	3.205	78.49*
Mar. 31.....	do.....	41.0	30.19	1.536	2.300	46.37
April 11.....	M. H. French.....	47.6	98.00	1.760	3.720	172.20
April 22.....	G. H. Whyte.....	27.9	26.76	1.760	2.380	47.33*
May 4.....	M. H. French.....	46.4	38.58	0.744	2.345	28.73
May 31.....	do.....	44.0	9.40	0.561	1.560	5.26
May 31.....	do.....	44.0	9.40	0.605	1.560	5.69
June 22.....	do.....	44.0	7.92	0.702	1.550	5.56
July 17.....	G. H. Whyte.....	4.0	1.22	0.541	1.270	0.66*

* Gauged below station.

DAILY GAUGE HEIGHT AND DISCHARGE of Gap Creek near Maple Creek, Sask., for 1911.

DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2 20	37.0	2 30	32 0	1 55	5 1	2 41	33.0
2			2 90	94 0	2 28	29 0	1.51	4 4	5.45	†361.0
3			2.00	25 0	2 27	27.0	1.50	4 2	3.80	163.0
4			1 84	19 0	2 26	25 0	1.61	6 2	3.70	151 0
5			1.70	14 0	2 25	25.0	1.39	2 4	3.40	117.0
6			1 80	8.0	2 20	23.0	1.44	3 2	2.76	56.0
7			1 80	16.0	2.18	22 0	1 39	2 4	1.83	11.0
8			2 90	85 0	2 16	21.0	1.39	2 4	1.68	7.6
9			3 00	94 0	2 15	21 0	1 39	2 4	1.59	5.8
10			4 35	251 0	2 12	20 0	1 41	2 7	1 54	4.9
11			*4 85	307 0	2 09	19 0	1 49	4 0	1 47	3.7
12			4 53	274 0	2.10	19 0	1 44	3 2	1 44	3 2
13			3 80	185 0	2 00	16 0	1 34	1 6	1 40	2.5
14			3 85	192 0	1 70	8 0	1 36	1 9	1.37	2.0
15			3 96	207.0	1 70	8 0	1.40	2 5	1.36	1 9
16			3 96	209 0	1 60	6 0	1.38	2 2	1.32	1.3
17			4 00	214 0	1.60	6.0	1 35	1 8	1 32	1.3
18			4 76	306 0	1 60	6.0	1.20	Nil	1.28	0.8
19			2 86	86 0	1 50	4 2	1 18	"	1.28	0.8
20			2 71	72 0	1 70	8 0	1.16	"	1 28	0.8
21			2 48	54 0	1 70	8.0	1 20	"	1 26	0.6
22			2 35	45 0	1 70	8 0	1 27	0.7	1.25	0.5
23	3.20	78 0	2 45	52 0	1 60	6.0	1.30	1 0	1.23	0.3
24	3.50	115 0	2 40	48 0	1.80	10.0	1.34	1 6	1.19	Nil
25	3.66	141 0	2 40	47.0	1.90	13.0	1.50	4.2		
26	2.86	66 0	2 38	44 0	1 90	13 0	1.92	14.0		
27	2.40	36 0	2 37	42 0	1 70	8.0	2 39	32.0		
28	2.16	27.0	2 35	39 0	1 70	8 0	2 15	21.0		
29	2.30	38 0	2 34	37 0	1 70	8 0	1 94	14.0		
30	2 28	39 0	2.32	35 0	1 66	7.2	1 64	6 8		
31	2.25	41 0			1 50	4 2				

* Observation made in the evening and may not be the mean for the day.
† Heavy rain.

NOTE.—The creek was dry from July 24 to Sept. 4. Rain on Sept. 5, 6 and 7 produced a large run-off during the first part of September, but as an observer could not be secured no records of it were obtained.

MONTHLY DISCHARGE of Gap Creek near Maple Creek, Sask., for 1911.

(Drainage area, 295 Square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (23-31)	141.0	27.0	64.6	0.219	0.073	1,153
April	307.0	8.0	104.6	0.355	0.396	6,224
May	32.0	4.2	14.1	0.048	0.055	867
June	32.0	0.0	4.9	0.017	0.018	292
July (1-24)	361.0	0.0	38.8	0.132	0.118	1,843
The period...					0.660	10,379

SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS of Bigstick Lake Drainage Basin, in 1911.

DATE.	Hydrographer.	Stream	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet</i>	<i>Sq. Feet.</i>	<i>Feet per Sec.</i>	<i>Sec.-Ft.</i>
May 9.....	M. H. French..	Cypress Creek...	Sec. 6-9-27-3	5.80	3.89	0.034	1.340
June 2....	do	do	do	*			0.691
May 11.....	do	Maple Creek....	S.E. 16-11-26-3	10.75	5.55	0.940	5.195

* Weir measurement.

MANY ISLAND LAKE DRAINAGE BASIN.

General Description.

Many Island Lake, about 25 square miles in area, is situated on the boundary line between the provinces of Alberta and Saskatchewan about ten miles north of the town of Walsh. It is the farthest west of the several lakes which receive the drainage of the north slope of the Cypress Hills. The water is shallow and alkaline. Its only source of water-supply is Mackay Creek with its tributaries, Stony and Boxelder Creeks.

The topography of the basin is very rough, and with the exception of a little timber around McAlister Lake at the head of the basin, the country is practically devoid of tree growth. The channels of all streams are deep and well defined. There is no irrigation work being done at present in this basin south of the main line of the Canadian Pacific Railway.

The annual precipitation, most of which falls during May, June and July, is usually about twelve inches. The run-off, therefore, all occurs in the first part of the summer and generally after that there is none for the remainder of the year.

EAST BRANCH OF MACKAY CREEK AT GRANT'S RANCHE, ALTA.

This station was established on October 13, 1911, by M. H. French. It is located in the N.W. $\frac{1}{4}$ Sec. 36, Tp. 10, Rge. 1, W. 4th Mer., about 100 feet north of Arthur Grant's house. It is about five miles south of Walsh and one mile above the junction of the east and west branches of Mackay Creek.

The channel is straight for 50 feet above and below the station. The right bank is a cut-bank and will never overflow. The left bank is rather low, covered with brush, and will overflow in extreme floods. The bed of the channel is composed of coarse gravel, and will not shift.

Discharge measurements are made with a current-meter by wading. The initial point for soundings is the face of a five-inch stake on the right bank, ten feet from the water's edge, and is well protected by a mound of stones. The final point is a willow stump on the left bank, 45.1 feet from the initial point and protected by a mound of stones.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post sunk in the bed of the stream near the right bank and just below the cross-section. The zero of the gauge (elev., 93.54) is referred to a bench-mark on the top of the initial-point stake (assumed elevation, 100.00) and to a bench-mark on the top of the final point (elev., 99.29).

The gauge was read by Arthur Grant.

DISCHARGE MEASUREMENTS of East Branch Mackay Creek at Grant's Ranche, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Oct. 13.....	M. H. French.....	16.7	12.54	0.223	1.00	2.80

MEAN DAILY GAUGE HEIGHT, in feet, of East Branch Mackay Creek at Grant's Ranche, Alta., for 1911.

DAY.	Oct.	Nov.
1		0.94
2		0.94
3		0.94
4		0.94
5		0.97
6		1.00
7		0.95
8		0.94
9		0.92
10		*
11		
12		
13	1.00	
14	1.00	
15	1.02	
16	1.05	
17	1.07	
18	1.10	
19	1.13	
20	1.13	
21	1.13	
22	1.12	
23	1.17	
24	1.15	
25	1.15	
26	1.08	
27	1.06	
28	1.00	
29	1.07	
30	0.98	
31	0.96	

* Creek frozen.

WEST BRANCH OF MACKAY CREEK AT SCHNEIDER'S RANCHE, ALTA.

This station was established on October 12, 1911, by M. H. French. It is located in the S.W. ¼ Sec. 23, Tp. 10, Rge. 2, W. 4th Mer., about 1000 feet from Jacob Schneider's house. It is twelve miles by trail southwest of Walsh.

The channel is straight for about 100 feet above and below the station. Both banks are high and not liable to overflow. The bed of the channel is composed of sand and gravel.

Discharge measurements are made with a current-meter by wading. The initial point for soundings is a four-inch stake on the left bank standing about three inches above ground and protected by a mound of stones. The final point is a similar stake on the right 50.5 feet from the initial point.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post sunk in the centre of the stream eighteen feet below the cross-section. The zero of the gauge (elev., 95.26) is referred to the top of the initial-point stake (assumed elevation, 100.00) and to the top of the final point (elev., 102.26).

The gauge was read by Jacob Schneider.

There is no flow for several months during the year at this point.

MACKAY CREEK AT WALSH, ALTA.

This station was established on July 29, 1909, by F. T. Fletcher. It is located at the traffic bridge half a mile south of the Canadian Pacific Railway track at Walsh. The bridge is on the N.W. ¼ Sec. 26, Tp. 11, Rge. 1, W. 4th Mer.

The channel is straight for about 225 feet above and 500 feet below the station. Both banks are clean, but liable to overflow at high stages. The bed is clean, composed of clay, and not liable to shift. The current is sluggish.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to an upright timber on the upstream side of the bridge near the right abutment.

During high water, discharge measurements are made from the downstream side of the bridge. At low stages, the discharge is measured by wading, and at extreme low water, a weir is used.

During 1911, the gauge was read by George Sept, general merchant, Walsh.

SESSIONAL PAPER No. 25d

DISCHARGE MEASUREMENTS of Mackay Creek at Walsh, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 6.....	J. C. Keith.....	14.5	20.17	0.50	1.10	10.95
May 24.....	do	12.5	14.45	0.27	0.86	3.96
June 10.....	do	7.4	2.35	0.57	0.54	1.34*
July 6.....	do	14.0	21.72	6.71	1.25	14.59†
Sept. 6.....	sdo	57.0	164.81	1.27	4.43	210.08†
Oct. 27.....	do	13.5	18.35	0.448	1.045	8.22†

* Gauging made 250 yards above traffic bridge.
† Gauging made from bridge.

DAILY GAUGE HEIGHT AND DISCHARGE of Mackay Creek at Walsh, Alta., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0.94	6.8	1 43	20 0	0 69	2.9
2.....			0.40	0.3	1 52	23.0	0.64	2.2
3.....			*		1 42	20.0	0 55	1.2
4.....			*		1 28	15.0	0.47	0.6
5.....			*		1 17	12 0	0.57	1.4
6.....			*		1 09	10.0	0.52	0.9
7.....			*		0 92	6.5	0.45	0.5
8.....			0.36	0.2	0 91	6 2	0.53	1.0
9.....			0.51	0.8	0 76	4 0	0 51	0.8
10.....			1.78	33.0	0 67	2 6	0 52	0.9
11.....			2.31	58.0	0 65	2 3	0 44	0.5
12.....			2.57	71.0	0 65	2.3	0 40	0.3
13.....			1.31	16.0	0 77	4 0	0 55	1.2
14.....			0.96	7.0	0 68	2.7	0.24	Nil
15.....			0.83	5.0	0 62	2 0	0 19	"
16.....			1.29	16.0	0 73	3 4	0.14	"
17.....			2.70	79.0	1.26	15.0	0.40	"
18.....			2.37	60.0	1.15	12 0	Dry	"
19.....	1.62	27.0	1.91	38.0	0 88	5 7	"	"
20.....	1.75	32.0	2.01	42.0	0 80	4 5	"	"
21.....	2.50	67.0	1.92	39.0	0 77	4 0	"	"
22.....	1 72	31.0	1.81	34.0	0 74	3 6	"	"
23.....	1.22	14.0	1.84	36.0	0 90	6 0	"	"
24.....	1.71	30.0	1.65	28.0	0 92	6 4	"	"
25.....	1.71	30.0	1.48	21.0	1 02	8 4	0.90	6.0
26.....	1.40	19.0	1.43	20.0	1.06	9.2	1 00	8.0
27.....	1.04	8.8	1.23	14 0	1.22	13 6	1 15	11.5
28.....	0.98	7.6	1.21	13.0	1.13	10 9	0 90	0.6
29.....	0.79	4.4	1.17	12 0	1 04	8 8	0 77	4.0
30.....	1.10	10.0	1.23	14.0	0 92	6 4	0 66	2.5
31.....	1.12	11.0			0 80	4 5		

DAILY GAUGE HEIGHT AND DISCHARGE of Mackay Creek at Walsh, Alta., for 1911.—*Con.*

Day.	July.		August.		September.		October.		November.	
	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1.29	16.0	Dry	Nil	Dry	Nil	0.77	4 0	0.86	5.4
2	3.56	137.0	"	"	"	"	0 72	3 3	0 60	1.7
3	1 77	33.0	"	"	"	"	0 69	2 9	0.66	2.5
4	1.21	13.0	"	"	"	"	0 79	4 4	0.65	2.3
5	1 25	14.0	"	"	0.65	2 3	1 16	11 8	0.65	2.3
6...	1.24	14.0	"	"	4.58	222.0	1 02	8 4	0 56	1.3
7.	0 93	7.0	"	"	6.22	388 0	0 91	6 2	0 72	3.3
8...	0.74	3.6	"	"	3.15	108.0	0 83	4 9	0 78	4.2
9.	0.66	2.5	"	"	2.55	70.0	0 76	3 9	*	†
10...	0.57	1.4	"	"	1 52	23 0	0 70	3 0	*.....	†.....
11...	0.50	0.7	"	"	1 25	14 5	0 66	2 5	*.....	†.....
12...	0.49	0.7	"	"	1.06	9 2	0 64	2 2	2.30	†.....
13...	0.43	0.4	"	"	0.92	6 5	0 60	1 7	1.10	†.....
14	0.29	Nil	"	"	0.80	4 5	0 58	1 5	1.21	†.....
15...	0.20	"	"	"	0.72	3 3	0 60	1 7	1 40	†.....
16.	0.11	"	"	"	0.64	2 2	0 58	1 5		
17.	0.10	"	"	"	0.57	1 5	0 56	1 3		
18...	0.06	"	"	"	0.56	1 3	0 60	1 7		
19...	0.02	"	"	"	0.58	1 5	0 66	2 5		
20...	Dry	"	"	"	0.82	4 8	0 67	2 6		
21...	"	"	"	"	0.70	3 0	0 70	3 0		
22...	"	"	"	"	0.67	2 7	0 75	3 8		
23...	"	"	"	"	0.70	3 0	0 78	4 2		
24	"	"	"	"	0.82	4 8	1 00	8 0		
25.	"	"	"	"	0.96	7 2	1 03	8 6		
26.	"	"	"	"	1 02	8 4	1 20	13 0		
27.	"	"	"	"	0.96	7 2	0 92	6 4		
28.	"	"	"	"	0.87	5 5	0 80	4 5		
29.	"	"	"	"	0.78	4 2	0 75	3 8		
30.	"	"	"	"	0.74	3 6	0 78	4 2		
31	"	"	"	"			0 82	4 8		

* Frozen over.
† Ice conditions Nov. 8 to Nov. 15.

MONTHLY DISCHARGE of Mackay Creek at Walsh, Alta., for 1911.
(Drainage area, 201 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (19-31)...	67.0	4.4	22.40	0 111	0.050	577
April	79.0	0.0	22.10	0 110	0.120	1315
May.....	23.0	2.0	8.23	0.041	0.050	506
June.....	11.5	0.0	1.74	0 009	0 010	105
July.....	137.0	0.0	7.80	0.039	0.040	480
August.....	00.0	0.0	0.00	0.000	0 000	000
September.....	388 0	0.0	30.50	0.152	0.170	1815
October.....	13.0	1.3	4 40	0.022	0.030	270
November (1-8)...	5.4	1.3	2.90	0.014	0.004	46
The period.....					0.474	5114

BOXELDER CREEK NEAR WALSH, ALTA.

This station was established May 24, 1909, by P. M. Sauder. It is located at John Young's farm on Sec. 2, Tp. 12, Rge. 30, W. 4th Mer., two miles east of Walsh.

The stream flows in one channel, which is crooked both above and below the gauge. The banks are high and not liable to overflow. The bed of the stream is composed of clay.

Discharge measurements are generally made by wading at or near the gauge, but during floods it may be measured from the Canadian Pacific Railway bridge a few hundred feet below the gauge.

The gauge, which is a plain staff graduated to feet and hundredths, is attached to a post at the right bank. It is referred to bench-marks as follows:—(1) the top of the frame of the outside cellar entrance of Mr. Young's house (elevation, 17.36 feet); (2) two spikes driven near the southeast corner of Mr. Young's house (elevation, 16.40 feet above the datum of the gauge).

During 1911, the gauge was read by John Young.

DISCHARGE MEASUREMENTS of Boxelder Creek near Walsh, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 6.....	J. C. Keith.....	9.5	5.36	0.710	1.05	3.825
May 24.....	do.....	9.0	4.48	0.540	0.95	2.394
June 10.....	do.....	8.0	2.98	0.270	0.76	0.810
July 6.....	do.....	13.6	15.94	0.788	2.04	12.560
Sept. 6.....	do.....	30.0	55.50	0.540	3.42	29.810†
Oct. 27.....	do.....					Nil.

† Gauging made from the C.P.R. bridge.

DAILY GAUGE HEIGHT AND DISCHARGE of Boxelder Creek near Walsh, Alta., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0.95	2.4	1.50	7.3	0.65	0.7
2.....			0.55	0.4	2.05	13.0	0.55	0.4
3.....			0.60	0.5	1.95	12.0	0.50	0.2
4.....			0.55	0.4	1.80	10.0	0.50	0.2
5.....			0.50	0.2	1.30	5.4	Dry	Nil
6.....			Dry	Nil	1.07	3.4	"	"
7.....			"	"	1.00	2.8	"	"
8.....			"	"	0.90	2.0	"	"
9.....			"	"	0.85	1.8	1.15	4.0
10.....			1.80	10.0	0.70	0.9	0.90	2.1
11.....	4.30	45.0	2.55	18.0	0.70	0.9	0.75	1.2
12.....	3.70	34.0	2.60	19.0	0.65	0.7	0.55	0.4
13.....	3.20	26.0	1.75	9.8	0.55	0.4	0.30	Nil
14.....	3.50	31.0	1.05	3.2	0.50	0.2	Dry	"
15.....	3.40	29.0	0.95	2.4	0.50	0.2	"	"
16.....	2.65	20.0	1.50	7.3	0.55	0.4	"	"
17.....	2.55	18.0	3.05	24.0	0.90	2.1	"	"
18.....	2.55	18.0	3.70	34.0	1.65	8.8	"	"
19.....	2.35	16.0	2.35	16.0	1.05	2.2	"	"
20.....	2.90	23.0	2.30	16.0	0.95	2.4	"	"
21.....	3.10	25.0	2.30	16.0	0.70	0.9	"	"
22.....	3.60	32.0	1.85	11.0	0.65	0.7	"	"
23.....	1.50	7.0	1.95	12.0	1.70	9.3	"	"
24.....	2.45	17.0	1.80	10.0	0.95	2.4	"	"
25.....	2.65	20.0	1.50	7.3	1.15	4.0	"	"
26.....	2.00	12.0	1.45	6.8	1.05	3.2	"	"
27.....	1.25	5.0	1.30	5.4	1.05	3.2	2.75	21.0
28.....	0.95	2.4	1.30	5.4	1.10	3.6	2.05	13.0
29.....	0.85	1.8	1.10	3.6	0.95	2.4	1.50	7.3
30.....	1.00	2.8	1.00	2.8	0.85	1.8	1.15	4.0
31.....	1.20	4.5			0.75	1.2		

DAILY GAUGE HEIGHT AND DISCHARGE of Boxelder Creek near Walsh, Alta., for 1911.—*Con.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.70	9.3	Dry	Nil	Dry	Nil	0.75	1.2
2.....	6.30	99.0	"	"	"	"	0.70	0.9
3.....	5.00	60.0	"	"	"	"	0.60	0.5
4.....	2.80	21.4	"	"	"	"	0.50	0.2
5.....	2.85	22.0	"	"	3.40	29.0	0.55	0.4
6.....	2.20	14.0	"	"	3.42	30.0	1.25	5.0
7.....	1.80	10.3	"	"	5.95	88.0	1.15	4.0
8.....	1.35	5.8	"	"	6.15	94.0	0.95	2.4
9.....	1.15	4.0	"	"	4.70	53.0	0.80	1.4
10.....	0.90	2.1	"	"	3.50	31.0	0.75	1.2
11.....	0.85	1.8	"	"	2.25	15.0	0.70	0.9
12.....	0.65	0.7	"	"	1.70	9.3	0.60	0.5
13.....	0.55	0.4	"	"	1.45	6.8	0.45	0.1
14.....	0.50	0.2	"	"	1.25	5.0	0.25	Nil
15.....	0.50	0.2	"	"	1.15	4.0		
16.....	Dry.	Nil	"	"	1.00	2.8		
17.....	"	"	"	"	0.90	2.1		
18.....	"	"	"	"	0.90	2.1		
19.....	"	"	"	"	0.90	2.1		
20.....	"	"	"	"	0.85	1.8		
21.....	"	"	"	"	0.80	1.4		
22.....	"	"	"	"	0.80	1.4		
23.....	"	"	"	"	0.80	1.4		
24.....	"	"	"	"	0.80	1.4		
25.....	"	"	"	"	0.90	2.1		
26.....	"	"	"	"	0.85	1.8		
27.....	"	"	"	"	2.60	19.0		
28.....	"	"	"	"	1.95	12.0		
29.....	"	"	"	"	0.90	2.1		
30.....	"	"	"	"	0.90	2.1		
31.....	"	"	"	"				

MONTHLY DISCHARGE of Boxelder Creek near Walsh, Alta., for 1911.
(Drainage area, 99 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (11-31).....	45.0	1.8	18.56	0.186	0.148	783
April.....	34.0	0.0	8.13	0.082	0.091	484
May.....	13.0	0.2	3.57	0.036	0.042	220
June.....	21.0	0.0	1.82	0.018	0.020	108
July.....	99.0	0.0	8.10	0.082	0.095	498
August.....	00.0	0.0	0.00	0.000	0.000	000
September.....	94.0	0.0	14.02	0.142	0.158	834
October (1-14).....	5.0	0.0	1.34	0.135	0.070	37
The period.....					0.624	2964

SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS of Many Island Lake Drainage Basin, in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. Feet.</i>	<i>Feet per Sec.</i>	<i>Sec.-Ft.</i>
June 16....	M. H. French..	McKay Creek.	Sec. 21-9-1-4				* 0.185
Nov. 4.....	W. A. Fletcher..	do	Sec. 23-13-1-4.				* 1.760
July 25.	M. H. French...	McKay Cr.....					
		East Br.....	Sec. 36-8-1-4.		.....		* 0.440
do	do	McKay Creek					
		West Br	Sec. 36-8-2-4		.....		* 0.300

* Weir measurement.

ROSS CREEK DRAINAGE BASIN.

General Description.

Ross Creek rises in Elkwater Lake, a small body of water covering an area of approximately two square miles, situated in Tp. 8, Rge. 3, west of the fourth meridian. The creek flows in a northerly direction as far as Irvine and then turns sharply to the westward, and closely parallels the main line of the Canadian Pacific Railway to Medicine Hat. Here it is joined by Sevenpersons River, and the combined flow empties into the South Saskatchewan in Sec. 32, Tp. 12, Rge. 5, west of the fourth meridian. The tributaries of Ross Creek are Bullshead Creek, which joins it in Sec. 21, Tp. 12, Rge. 5, west of the fourth meridian, and Grosventre Creek, which joins it in Sec. 14, Tp. 11, Rge. 3, west of the fourth meridian

The topography of this basin is exceedingly rough and rolling and almost totally devoid of tree growth. The one exception is a small area of the Forest Reserve, just south of Elkwater Lake, which has a good stand of pine and spruce.

The Canadian Pacific Railway takes the water-supply for its tank at Irvine from Ross Creek.

ROSS CREEK AT ROBINSON'S RANCHE, ALTA.

This station was established on October 11, 1911, by M. H. French. It is located about 200 feet south of James Robinson's house, in the N.W. 1/4 Sec. 24, Tp. 9, Rge. 3, W. 4th Mer., and is about thirty miles southeast of Medicine Hat.

The channel is straight for about 75 feet above and 50 feet below the station. Both banks are high enough to carry all stages of the stream. The bed of the stream is composed of very coarse gravel and will not shift.

The fall of the stream at this point is very great. Water runs here all summer, but the discharge being very small, it is soon lost by seepage and evaporation a short distance downstream.

Discharge measurements are made with a current-meter by wading. The initial point for sounding is a five-inch stake on the right bank 50 feet from the water's edge. It is painted red and is protected by a mound of stones. The final point for soundings is a stake on the left bank 103.2 feet from the initial point.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post sunk in the bed of the stream near the right bank, eighteen feet above the cross-section. The zero of the gauge (elev., 92.91)is referred to the top of the initial-point stake (assumed elevation, 100.00) and to the top of the final point (elev., 99.41).

The gauge was read by James Robinson.

DISCHARGE MEASUREMENTS of Ross Creek at Robinson's Ranche, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Oct. 11.....	M. H. French	14.3	4.58	0.555	1.11	2.54

MEAN DAILY GAUGE HEIGHT, in feet, of Ross Creek at Robinson's Rancho, Alta., for 1911.

DAY	Oct	Nov.
1		1.15
2		1.13
3		1.13
4		1.16
5		1.14
6		1.12
7		1.12
8		1.09
9		1.08
10		1.00
11	1.11	0.75
12	1.11	0.75
13	1.11	0.70
14	1.10	0.60
15	1.10	0.60
16	1.10	*
17	1.10	
18	1.13	
19	1.16	
20	1.19	
21	1.20	
22	1.20	
23	1.22	
24	1.24	
25	1.30	
26	1.35	
27	1.40	
28	1.35	
29	1.18	
30	1.13	
31	1.13	

* Creek frozen.

GROSVENTRE CREEK AT TOTHILL'S FARM, ALTA.

This station was established on October 10, 1911, by M. H. French. It is located about 50 feet west of Mr. Tothill's house in the S.E. $\frac{1}{4}$ Sec. 27. Tp. 9, Rge. 4, west of the 4th meridian, and is about 28 miles southeast of Medicine Hat. This stream runs every spring while the snow is melting, and is then dry during the remainder of the summer excepting after a heavy fall of rain when the water comes down in a flood.

The channel is straight for 50 feet above and 100 feet below the station. Both banks are high enough to hold all stages. The bed of the stream is composed of coarse gravel, and is not liable to shift.

The gauge, which is a plain staff graduated to feet and hundredths, is firmly nailed to a post sunk in the bed of the stream near the right bank, eighteen feet above the cross-section. The zero of the gauge (elev., 94.12) is referred to the top of a rock (assumed elev., 100.00), situated on the left bank just behind a stake used as the initial point for soundings. This rock is about two feet long, stands out of the ground about one foot, and is about 40 feet from the water's edge in low water.

Discharge measurements are made with a current-meter by wading. The gauge was read daily by Kate Tothill till it froze up in November. The flow was only a small seepage through the gravel.

DISCHARGE MEASUREMENTS of Grosventre Creek at Tothill's Farm, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 10.....	M. H. French.....	13.5	6.33	0.042	0.50	0.27*

* Gauged down stream.



Canadian Pacific Railway Company's Dam in Ross Creek at Irvine.



Gauging Station on Ross Creek at Irvine. Taken by J. C. Keith.

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Grosventre Creek at Tothill's Farm, Alta., for 1911.

DAY.	October		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-Ft.
1				
2			0.52	
3			0.52	
4			0.64	
5			0.74	
6			0.62	
7			0.64	
8			Frozen	
9				
10	0.50			
11	0.47			
12	0.46			
13	0.46		Open.	
14	0.46			
15	0.46			
16	0.48			
17	0.47			
18	0.56			
19	0.54			
20	0.54			
21	0.57			
22	0.58			
23	0.60			
24	0.61			
25	0.58			
26	0.55		Ice on Creek	
27	0.55			
28	0.56			
29	0.55			
30	0.54			
31				

ROSS CREEK AT IRVINE, ALTA.

This station was established on July 28, 1909, by F. T. Fletcher. It is located at the traffic bridge in the town of Irvine, on Sec. 31, Tp. 11, Rge. 2, west of the 4th meridian, and about 400 yards below the Canadian Pacific Railway dam.

The stream flows in one channel, which is slightly curved for 75 feet above the station, and almost straight for 600 feet below. The banks are composed of clay, high and not liable to overflow. The bed is composed of sand and gravel, and may shift at high stages.

Discharge measurements are made from the downstream side of the bridge during high stages of the stream, and during low water it is waded. During extreme low water a weir is used.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to the downstream pile of the first row from the left abutment. It is referred to bench-marks as follows:— (1) the top of the downstream pile in the first row from the left abutment (elevation, 15.52 feet above the datum of the gauge; (2) the top of the south rail of the Canadian Pacific Railway track (elevation, 23.11).

During 1911, the gauge was read by H. G. Price.

DISCHARGE MEASUREMENTS of Ross Creek at Irvine, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
May 6	J. C. Keith	10.0	5.00	1.074	1.18	5 372*
May 24	do	12.0	7.08	1.140	1.31	8.090*
June 12	do	3.1	0.46	0.344	0.79	0.167
July 7	do	15.7	11.71	1.340	1.70	15 650
Sept. 7	do	32.0	75.86	1 520	4.14	115 680
Oct. 28	do				1.05	9.300

* Gauging 200 feet upstream.

DAILY GAUGE HEIGHT AND DISCHARGE of Ross Creek at Irvine, Alta., for 1911.

DAY.	March.		April.		May.		June.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.70	15.0	1.98	22.0	1.28	7.4
2.....			1.42	9.8	1.89	20.0	1.28	7.4
3.....			1.12	4.7	1.79	17.0	1.26	7.0
4.....			0.92	1.8	1.78	17.0	1.24	6.7
5.....	0.04	Nil	0.92	1.8	1.77	17.0	1.21	6.2
6.....	0.02	"	0.95	2.2	1.20	6.0	1.17	5.5
7.....	0.22	"	0.80	0.5	1.20	6.0	1.14	5.0
8.....	1.18	5.7	0.82	0.7	1.18	5.7	1.12	4.7
9.....	3.28	71.0	1.35	8.6	1.17	5.5	1.10	4.4
10.....	2.38	34.0	2.60	42.0	1.16	5.4	1.02	3.1
11.....	2.89	54.0	3.82	98.0	1.16	5.4	0.87	1.3
12.....	3.92	103.0	3.15	64.0	1.16	5.4	0.80	0.5
13.....	3.48	81.0	2.75	48.0	1.15	5.2	0.78	0.4
14.....	3.60	87.0	2.06	24.0	1.16	5.4	0.75	0.2
15.....	3.25	70.0	3.55	84.0	1.16	5.4	0.72	0.1
16.....	4.58	143.0	4.11	115.0	1.18	5.7	0.72	0.1
17.....	2.18	28.0	3.82	98.0	1.17	5.5	0.72	0.1
18.....	3.35	74.0	3.36	75.0	1.17	5.5	0.72	0.1
19.....	5.15	177.0	2.28	30.0	1.19	5.8	0.72	0.1
20.....	4.60	144.0	2.16	27.0	1.22	6.3	0.72	0.1
21.....	5.00	168.0	2.08	25.0	1.20	6.0	0.72	0.1
22.....	4.60	141.0	2.00	22.0	1.18	5.7	0.72	0.1
23.....	3.32	73.0	1.98	22.0	1.23	6.5	0.70	0.0
24.....	2.46	36.0	1.90	20.0	1.29	7.5	0.70	0.0
25.....	2.75	48.0	1.85	19.0	1.39	9.2	0.70	0.0
26.....	1.95	21.0	1.84	19.0	1.46	10.0	0.70	0.0
27.....	1.82	18.0	1.85	19.0	1.46	10.0	0.91	1.7
28.....	1.76	17.0	2.15	27.0	1.32	8.0	0.94	2.1
29.....	1.84	19.0	2.10	25.0	1.31	7.9	1.18	5.7
30.....	1.89	20.0	2.08	25.0	1.30	7.7	1.20	6.0
31.....	2.00	22.0			1.28	7.4		

DAILY GAUGE HEIGHT AND DISCHARGE of Ross Creek, at Irvine, Alta. for 1911.—Con.

DAY.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.26	7.0	0.69	Nil	0.73	0.2	1.02	3.1	1.01	3.0
2.....	3.98	107.0	0.69	"	0.73	0.2	1.00	2.8	1.01	3.0
3.....	3.80	97.0	0.69	"	0.85	1.0	1.10	4.4	1.00	2.8
4.....	3.50	82.0	0.69	"	1.66	14.5	1.18	5.7	0.99	2.7
5.....	2.70	46.0	0.69	"	2.62	43.0	1.25	6.8	0.99	2.7
6.....	2.10	25.0	0.69	"	4.30	126.0	1.24	6.7	0.99	2.7
7.....	1.74	16.0	0.85	1.0	4.10	114.0	1.19	5.8	0.99	2.7
8.....	1.44	10.0	1.02	3.1	3.30	72.0	1.14	5.0	0.99	2.7
9.....	1.26	7.0	1.10	4.4	2.45	36.0	1.08	4.1	0.99	2.7
10.....	1.01	3.0	1.09	4.2	1.86	19.0	1.03	3.3	0.99	2.7
11.....	0.98	2.6	1.08	4.1	1.59	13.0	0.98	2.6	0.99	2.7
12.....	0.96	2.3	1.06	3.8	1.40	9.4	0.96	2.3	0.99	2.7
13.....	0.84	0.9	0.98	2.6	1.28	7.4	0.99	2.7	0.99	2.7
14.....	0.80	0.5	0.90	1.6	1.26	7.0	1.02	3.1	1.00	2.8
15.....	0.76	0.3	0.82	0.7	1.23	6.5	1.02	3.1	1.00	2.8
16.....	0.74	0.2	0.78	0.4	1.19	5.8	1.01	3.0		
17.....	0.73	0.2	0.74	0.2	1.09	4.2	1.02	3.1		
18.....	0.72	0.1	0.74	0.2	1.04	3.4	1.04	3.4		
19.....	0.70	Nil	0.74	0.2	1.02	3.1	1.08	4.1		
20.....	0.69	"	0.74	0.2	1.01	3.4	1.11	4.6		
21.....	0.69	"	0.74	0.2	1.05	3.6	1.14	5.0		
22.....	0.69	"	0.74	0.2	1.04	3.4	1.15	5.2		
23.....	0.69	"	0.74	0.2	1.12	4.7	1.14	5.0		
24.....	0.69	"	0.74	0.2	1.20	6.0	1.12	4.7		
25.....	0.69	"	0.74	0.2	1.29	7.5	1.11	4.6		
26.....	0.69	"	0.74	0.2	1.24	6.7	1.10	4.4		
27.....	0.69	"	0.74	0.2	1.20	6.0	1.08	4.1		
28.....	0.69	"	0.74	0.2	1.14	5.0	1.06	3.8		
29.....	0.69	"	0.73	0.2	1.10	4.4	1.04	3.4		
30.....	0.69	"	0.73	0.2	1.06	3.8	1.03	3.3		
31.....	0.69	"	0.73	0.2			1.07	3.9		

MONTHLY DISCHARGE of Ross Creek at Irvine, Alta., for 1911.

(Drainage area, 240 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (5-31).....	177.0	0.0	61.30	0.255	0.256	3284
April	115.0	0.5	32.40	0.135	0.151	1928
May.....	22.0	5.2	8.49	0.035	0.040	522
June.....	7.4	0.0	2.54	0.011	0.012	151
July.....	107.0	0.0	13.10	0.055	0.063	805
August.....	4.4	0.0	0.93	0.004	0.005	57
September.....	126.0	0.2	18.00	0.075	0.084	1071
October.....	6.8	2.3	4.10	0.017	0.020	252
November (1-15).....	3.0	2.7	2.76	0.012	0.007	82
The period.....					0.638	8152

BULLSHEAD CREEK AT CLARK'S RANCHE, ALTA.

This station was established on October 9, 1911, by M. H. French. It is located about 200 feet north of Mr. Clark's house, in the N.W. ¼ Sec. 15, Tp. 9, Rge. 5, west of the 4th meridian, and is about 25 miles from Medicine Hat.

The channel is straight for about 100 feet above and below the station. Both banks are high enough to carry anything but an extreme flood. The bed of the stream is composed of coarse gravel and small stones, and will not shift.

Discharge measurements are made by wading at a section about 1133 feet below the gauge. The gauge, which is a plain staff graduated to feet and hundredths, is firmly nailed to a post sunk in the bed of the stream near the left bank. The zero elev., 95.28, is referred to the top of a six-inch stake, four feet long, driven flush with the ground, situated thirteen feet south of the gauge and protected by a mound of stones (assumed elev., 100.00). The gauge was read by Mr. Edward Clark.

DISCHARGE MEASUREMENTS of Bullshead Creek at Clark's Ranche, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Oct. 9.....	M. H. French	16.0	3.80	0.184	1.18	0.70*

* Gauged 100 feet down stream.

DAILY GAUGE HEIGHT AND DISCHARGE of Bullshead Creek at Clark's Ranche, Sask., for 1911.

DAY.	October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			1.28	
2			1.25	
3.....			1.29	
4			1.30	
5			1.35	
6.....			1.40	
7			1.35	
8			1.25	
9	1.18		1.20	
10	1.19		Frozen Over.	
11.....	1.19			
12	1.19			
13	1.18			
14.....	1.19			
15	1.18			
16	1.18			
17	1.17			
18.....	1.25			
19	1.20			
20	1.25			
21				
22	1.30			
23	1.32			
24	1.35			
25	1.30			
26	1.30			
27	1.25			
28	1.25			
29	1.25			
30	1.30			
31	1.27			

STARKS AND BURTON DITCH NEAR WOOLCHESTER, ALTA.

This station was established on October 9, 1911, by W. A. Fletcher. It is located on the S.E. 1/4 Sec. 17, Tp. 11, Rge. 5, W. 4th Mer., about 260 feet below the head-gate at the intake to the ditch. The gauge, which is a plain staff graduated to feet and inches, is nailed to a post at the right bank. The zero of the gauge (elev., 97.87) is referred to the top of a stake (assumed elev., 100.00), in the right bank and six feet upstream from the gauge. The ditch is straight for 250 feet above and 50 feet below the gauge. The cross-section is uniform, and the bed and banks of the ditch are in good condition at this point.

SESSIONAL PAPER No. 25d

Discharge measurements may be made with a current-meter by wading near the gauge at ordinary stages and with a weir at very low stages.
No water was used after the gauge was installed.

BULLSHEAD CREEK NEAR DUNMORE, ALTA.

This station was established July 26, 1909, by F. T. Fletcher. It is located at the traffic bridge on the S.W. ¼ Sec. 16, Tp. 12, Rge. 5, W. 4th Mer. It is four miles from Medicine Hat, and one mile above the junction of Ross and Bullshead Creeks.
The stream flows in one channel, which is straight for about 200 feet above and 450 feet below the station. The banks are high, clean and not liable to overflow. The bed is composed of sand, and shifts.
During high water discharge measurements are made from the bridge, but during low water the discharge is measured by wading, or by means of a weir.
The gauge, which is a plain staff graduated to feet and hundredths, is spiked to the downstream side of the first row of piles from the right abutment. It is referred to the following bench-marks:—(1), a spike driven in the top of the centre row of piles (elevation, 7.39); (2) the top of a wooden plug driven flush with the ground in the road mound on right bank (elevation, 6.34).
During 1911, the gauge was read by G. G. Trimble.

DISCHARGE MEASUREMENTS of Bullshead Creek near Dunmore, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 8	J. C. Keith.....	6.7	2.46	0.77	0.68	1.900
May 25.....	do	6.7	1.87	0.52	0.70	0.970
June 12.....	do				0.55	0.012
July 7.....	do	9.3	4.59	1.17	0.97	5.390
Sept. 9.....	do	10.1	7.25	1.98	1.15	14.340
Nov. 1	do	2.0	0.43	0.44	0.60	0.190

MISCELLANEOUS DISCHARGE MEASUREMENTS of Ross Creek Drainage Basin, in 1911.

Date	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. Feet.</i>	<i>Feet per Sec.</i>	<i>Sec.-Ft.</i>
June 15	M. H. French..	Ross Creek.....	Sec. 25-9-3-4.				* 0.71
July 24.....	do	do ...	Sec. 36-8-3-4.				* 0.85
Oct. 28.....	W. A. Fletcher.	do	N.E. 7-12-3-4.				* 0.42

* Weir measurement.

SEVENPERSONS RIVER DRAINAGE BASIN.

General Description.

Sevenpersons River lies between the South Saskatchewan River and the Cypress Hills, and empties into the South Saskatchewan River at Medicine Hat. The catchment area consists almost entirely of open level prairie, with a small rainfall and very little run-off. During the early spring freshets and after very heavy rains there is a good flow for a few days, but at other times the stream is either dry or almost dry.
The soil is good, and dry farming is carried on quite successfully, but, owing to the limited water supply, irrigation is not likely to be attempted.
Records on this stream are taken for general statistical purposes.

SEVENPERSONS RIVER AT MEDICINE HAT, ALTA.

This station was established on April 27, 1910, by H. R. Carscallen. It is located in the N.E. ¼ Sec. 30, Tp. 12, Rge. 5, W. 4th Mer., at the bridge on the road from Medicine Hat to Dunmore Junction and about one and a half miles east of the Canadian Pacific Railway station at Medicine Hat.

The channel is straight for about 100 feet above and below the station. Both banks are high and wooded. The stream-bed is sandy and liable to change at high water.

During high-water stages, discharge measurements are made with a current-meter. The initial point of soundings is the inner face of the left abutment of the bridge. Low-water measurements are made with a weir.

The gauge, which is a plain staff graduated to feet and hundredths, is attached to the west, or left, abutment of the bridge. It is referred to two bench-marks, viz.:—(1) the top of a bolt-head in the cap of the right abutment (elevation, 10.41 above the datum of the gauge); (2) the head of a spike driven into a large stump about 100 feet east of the gauge (elevation, 11.40 above the zero of the gauge).

Because of apparent inaccuracies in observations, the gauge-height records for 1911 are not considered satisfactory and have not been used. There is, therefore, no table of daily gauge-height and discharge for 1911.

DISCHARGE MEASUREMENTS of Sevenpersons River at Medicine Hat, Alta., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 8.....	J. C. Keith.....	6.8	1.17	0.480	0.840	0.571
May 25.....	do				0.780	0.208*
June 12.....	do				0.540	0.008*
July 7.....	do	15.5	14.52	2.216	1.385	32.290
Sept. 9.....	do				0.540	0.009*
Nov. 1.....	do	2.2	0.25	0.430	0.550	0.107

* Weir measurement.

LAKE JOHNSTON DRAINAGE BASIN.

General Description.

Lake Johnston lies about twenty miles southwest of the City of Moose Jaw. It is about twenty-five miles long and fifteen wide and covers an area of nearly five townships. Almost all the drainage into the lake comes from the south and west through Wood River. The main tributaries of Wood River are Wiwa Cree,k Notukeu Creek, Pinto Creek and Wood Creek. These drain a large area, but, owing to the limited rainfall and the small slope of the drainage basin, the run-off is comparatively small.

Lake Johnston has no surface outlet and there has been no surface flow from Lake Chaplin to Lake Johnston for several years, but it will be noted that the elevation of the two lakes is the same. There is often considerable flow in Wood River in the spring, and there is always some discharge, but the lake has during recent years receded.

The lower part of Wood River has a very small fall, and is more of the nature of a long slough than that of a running stream. The channel is from twenty to fifty feet wide, and is from two to five feet deep. The bottom is composed of soft clay and is covered with weeds and grass. There is so little fall that it would be impossible to take out water by gravity and a dam would flood a large area of good agricultural land. There is, therefore, little possibility of irrigation development in this basin.

This drainage basin includes a large area of very good agricultural lands. These are pretty well taken up by settlers and are being farmed with good results.

SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS of Lake Johnston Drainage Basin, in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge
				<i>Feet.</i>	<i>Sq. Feet.</i>	<i>Feet per Sec.</i>	<i>Sec.-Ft.</i>
June 13.....	N.M. Sutherland	Bull Creek.....	S.W. 6-8-14-3.	.....	.....	.....	* 0 202
July 10.....	do	do	do .....	.....	.....	.....	* 1 249
July 29.....	do	do	do .....	.....	.....	.....	* 0 139
Aug. 12.....	do	do	do .....	.....	.....	.....	* 1 163
June 28.....	do	Chaplin River..	S.W. 12-14-3-3..	.....	.....	.....	0 000
June 22..	do	Creek, A.....	Sec. 20-4-3-3..	.....	.....	.....	* 0 050
June 25.....	do	do	Sec. 28-7-5-3..	.....	.....	.....	0 000
June 25.....	do	do	S.W. 24-5-7-3..	.....	.....	.....	0 000
June 25.....	do	do	N.W. 9-5-6-3..	.....	.....	.....	0 000
June 25.....	do	do	N.W. 4-5-5-3..	.....	.....	.....	0 262
June 25.....	do	do	N.E. 4-5-5-3..	.....	.....	.....	0 000
June 25.....	do	do	N.W. 5-5-5-3..	.....	.....	.....	0 344
June 25.....	do	do	S.W. 3-5-5-3..	.....	.....	.....	0 000
June 25.....	do	do	S.E. 24-5-7-3..	.....	.....	.....	0 000
June 26.....	do	do	S.E. 21-5-9-3..	.....	.....	.....	0 000
July 24.....	do	do	Sec. 20-4-3-3 ..	.....	.....	.....	0 100
July 26.....	do	McDonald Creek	Sec. 25-9-8-3..	.....	.....	.....	0 000
Sept. 20.....	do	Mosquito Creek	Sec. 20-11-10-3.	.....	.....	.....	0 000
June 13.....	do	Notukeu Creek.	N.W. 3-9-14-3..	.....	.....	.....	* 0 309
June 26.....	do	do	N.E. 24-11-5-3.	18 0	16 4	0.23	3 830
July 9.....	do	do	N.W. 3-9-14-3.	.....	.....	.....	* 2.257
July 29.....	do	do	Sec. 18-9-14-3..	.....	.....	.....	* 0 139
July 31.....	do	do	Sec. 29-9-12-3..	4 4	1.09	0.61	0 670
Aug. 11.....	do	do	N.W. 18-9-13-3.	.....	.....	.....	* 0 056
Sept. 14.....	do	do	N.E. 24-11-5-3.	12 8	13.89	0 30	4 180
Sept. 19.....	do	do	Sec. 5-11-10-3..	11.8	9.88	1.20	11.760
June 12.....	do	Pierce Creek...	S.W. 34-10-14-3	.....	.....	.....	* 0 505
July 8.....	do	do	do .....	.....	.....	.....	* 0 629
July 31.....	do	do	S.W. 36-9-13-3.	.....	.....	.....	0 030
Aug. 11.....	do	do	S.W. 34-10-14-3	.....	.....	.....	* 0 446
June 25.....	do	Pinto Creek....	Sec. 23-8-6-3..	.....	.....	.....	0 050
July 24.....	do	Sixmile Creek...	S.W. 17-4-4-3..	.....	.....	.....	0 050
Aug. 1.....	do	Whiskey Creek...	S.E. 36-11-13-3..	4 6	1 47	1 04	1 530
Sept. 19.....	do	do	S.W. 17-11-10-3	.....	.....	.....	* 1 183
Sept. 26.....	do	Wiwa Creek....	Sec. 36-12-5-3..	.....	.....	.....	0 000
Sec. 14.....	do	do	do .....	.....	.....	.....	0 000
June 26.....	do	Wood River. ...	Sec. 31-9-4-3..	10.0	18.8	0.36	6 760
June 25.....	do	do	S.E. 23-5-7-3..	.....	.....	.....	0 030
June 26.....	do	do	N.W. 9-5-10-3..	.....	.....	.....	0 000
Sept. 12.....	do	do	N.W. 18-10-4-3.	12.2	4.31	1.21	5 210
Sept. 14.....	do	do	N.W. 4-13-4-3..	32.0	15.7	0.53	8 270
Sept. 11.....	do	Wood Creek	Sec. 20-4-3-3..	.....	.....	.....	* 0 822
Sept. 11.....	do	do	N.E. 4-6-3-3..	7 0	5.87	0 74	4 360

* Weir measurement.

ROCKY CREEK DRAINAGE BASIN.

General Description.

Rocky Creek lies between Frenchman River and Poplar River. With its many tributaries it drains the southwestern slope of Wood Mountain. The main stream has its source in Tp. 3, Rge. 5, west of the third meridian, and crossing the international boundary near the southwest corner of Sec. 2, Tp. 1, Rge. 6, west of the third meridian, eventually finds its way into Milk River near Hinsdale in Montana. There is only a small portion of the drainage basin of this stream in Canada.

Owing, possibly, to the elevation, the precipitation in the upper part of this basin is a little above the average for the surrounding prairie. All the streams in the basin have a good flow during the spring freshet period, but soon recede, and most of the time they are all dry or have water only in pools, except the main stream, which generally has at least a small flow at all seasons. The upper portion of the drainage basin consists of rolling prairie land very much cut up by coulees and ravines. There are small areas of heavy gumbo land, but for the most part the soil is good and productive, and that portion of the drainage basin lying in Canada is quite suitable for ranching or mixed farming. Being remote from railways, very little of the land has been taken up by settlers.

Owing to the rolling nature of the lands and the limited water supply, irrigation can be developed but little in this basin.

MISCELLANEOUS DISCHARGE MEASUREMENTS of Rocky Creek Drainage Basin, in 1911.

DATE	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity	Discharge.
				Feet.	Sq. Feet.	Feet per Sec.	Sec.-Ft.
June 18..	N.M. Sutherland	Bluff Creek...	S.W. 1-1-9-3				Nil.
July 14..	do	do	do				Nil.
Aug. 16..	do	do	do				Nil.
June 19..	do	Creek, A.	S.W. 1-1-7-3..				Nil.
June 19..	do	do	N.W. 3-1-6-3..	3.1	0.38	0.87	0.72
June 19..	do	do	Sec. 12-1-6-3.				Nil.
July 17..	do	do	N.W. 3-1-6-3.				0.05
June 18..	do	Coulee, A.....	S.E. 6-1-9-3..				Nil.
July 14..	do	do	do				Nil.
July 18..	do	do	Sec. 6-1-4-3...				Nil.
June 18..	do	McEachran Cr.	S.W. 6-1-7-3..				Nil.
July 15..	do	do	do				Nil.
Aug. 17..	do	do	do				Nil.
Aug. 19..	do	Rice Creek.....	N.W. 3-1-6-3..				* 0.03
June 19..	do	Rocky Creek..	S.E. 5-1-6-3..	10.3	4.18	0.77	3.20
June 20..	do	do	Sec. 18-2-4-3..	4.2	2.55	1.48	3.78
June 21..	do	do	do	4.1	3.54	1.96	6.93
July 17..	do	do	S.E. 5-1-6-3...	5.0	1.47	0.69	1.01
Aug. 19..	do	do	do				* 0.918
Aug. 19....	do	do	do				* 1.05
July 15..	do	Rocky Creek, West Br....	S.W. 1-1-7-3...				* Nil.
Aug. 17...	do	do	S.W. 1-1-7-3...				Nil.

* Weir measurement.

POPLAR RIVER DRAINAGE BASIN.

General Description.

Poplar River rises in Tp. 3, Rge. 3, west of the third meridian, and with its many tributaries drains the southeastern slope of Wood Mountain. The main stream crosses the International Boundary near the southwest corner of Sec. 1, Tp. 1, Rge. 29, west of the second meridian, and empties into Missouri River near Poplar in Montana. There is only a small portion of the drainage basin of this stream in Canada.

Owing, possibly, to the elevation, the precipitation in the upper part of this basin is a little above the average for the surrounding prairie. All the streams in the basin have a good flow during the spring freshet period, but soon recede and most of the time they have only a very small flow.

In the lower part of the basin the fall in the main stream is very small. The channel is from thirty to seventy-five feet wide and from two to three feet deep. The current is sluggish and the channel is full of weeds. The banks of the stream are low, and liable to overflow at the time of the spring freshet.

The upper portion of the drainage basin consists of rolling prairie and that portion lying in Canada is quite suitable for ranching or mixed farming. Being remote from railways, little of the land has been taken up by settlers. Irrigation development will be limited to the water-supply.

SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS of Poplar River Drainage Basin, in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity	Discharge.
				<i>Feet.</i>	<i>Sq. Feet.</i>	<i>Feet per Sec.</i>	<i>Sec.-Ft.</i>
July 20.	N.M.Sutherland.	Creek, A.....	S.W. 3-2-29-2...				Nil.
July 21.	do	do	Sec. 13-14-29-2				0.020
Sept. 5.	do	do	N.W. 2-4-1-3.				* 0.994
Sept. 5.	do	do	N.W. 28-3-30-2..				* 0.110
Aug. 22.	do	Coulee, A.....	Sec. 1-1-3-3				Nil.
Aug. 22.	do	do	Sec. 3-1-3-3....				Nil.
Aug. 23.	do	do	Sec. 5-1-28-2...				Nil.
Aug. 22.	do	Cool Creek.....	Sec. 5-1-1-3....				Nil.
Sept. 9.	do	Hay Meadow Cr	N.E. 3-4-30-2	8.90	7.04	1.88	13.260
Sept. 10	do	do	S.W. 17-4-1-3...				* 0.369
Aug. 16.	do	Police Creek....	S.E. 6-1-9-3...				Nil.
July 20.	do	Poplar River....	S.E. 8-1-29-2...				* 0.837
Aug. 23.	do	do	S.E. 1-1-29-2...				* 0.467
Aug. 23.	do	do East Br.	S.E. 4-1-26-2...	13.80	6.33	0.79	5.060
July 19.	do	do West Br.	S.W. 5-1-3-3...				0.077
Aug. 20...	do	do	S.E. 5-1-3-3....				0.050

* Weir measurement.

BIGMUDDY CREEK DRAINAGE BASIN.

General Description.

Bigmuddy Creek has no well defined course in Canada, but develops from a depression running southeast from Bigmuddy Lake, and after crossing the International Boundary flows southward and empties into the Missouri River near Cuthbertson, Montana.

The source of Beaver Creek, a tributary of Bigmuddy Creek, is in Canada, but it, too, is a small and unimportant stream.

That portion of the drainage basin lying in Canada consists of alkali flats and rough rolling prairie. It is quite suitable for ranching purposes, but, being remote from railways, few settlers have taken up land in this drainage basin.

MISCELLANEOUS DISCHARGE MEASUREMENTS of Bigmuddy Creek Drainage Basin, in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. Feet.</i>	<i>Feet per Sec.</i>	<i>Sec.-Ft.</i>
Aug. 24.....	N.M. Sutherland	Beaver Creek..	S.E. 5-1-23-2 ...				* 0.539
Aug. 30.....	do	Bigmuddy Flat	Sec. 10-1-22-2...				Nil.
Aug. 31.....	do	Beaver Crk. Br..	Sec. 33-1-23-2				Nil.
Aug. 24.....	do	Creek A.....	Sec. 3-1-23-2				0.100
Aug. 23.....	do	Coulee A.....	Sec. 5-1-25-2				Nil.
Aug. 28.....	do	do	Sec. 1-1-21-2				Nil.

* Weir measurement.

QU'APPELLE RIVER DRAINAGE BASIN.

General Description.

Qu'Appelle River rises in Township 23, Range 4, west of the third meridian, and flows eastward into the Assiniboine River in Township 28, Range 17, west of the first meridian. These waters eventually find their way into Hudson Bay through the Red River, Lake Winnipeg and Nelson River.

The chief tributaries of Qu'Appelle River are Moosejaw Creek, Last Mountain, Wasikana Creek and Loon Creek. Last Mountain is the largest lake in the basin, being some sixty miles long and from one to three miles wide.

The valley of the main stream is from two to three hundred feet deep, with a flat from one to three miles wide along the river. This flat is covered in many places with brush, and the hill-sides are in many places well wooded. The bench-lands above the river are mostly level prairie, much of which is now under cultivation.

The mean annual rainfall at Moosejaw is fourteen inches, at Regina fifteen inches, and at Indian Head nineteen inches. The streams are frozen during the winter months and there is usually an abundant snow-fall.

There are several irrigation and many industrial water-rights in this basin.

QU'APPELLE RIVER AT LUMSDEN, SASK.

This station was established on May 12, 1911, by J. C. Keith. It is located at a private bridge on the N.W. 1/4 Sec. 33, Tp. 19, Rge. 21, W. 2nd Mer., in the north end of the town of Lumsden, and is about three miles below the mouth of Waskana Creek and a little over a mile above the mouth of Boggy Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is fastened to the downstream side of the left abutment of the bridge. The zero of the gauge (elev., 85.33) is referred to a permanent iron bench-mark (assumed elev., 100.00), situated 34 feet from the southeast corner of the bridge.

The channel is straight for 200 feet above and 100 feet below the station. Both banks are fairly high, but may overflow in an excessive flood. The bed of the stream is composed of gravel, and is not likely to shift. The current is moderate.

Discharge measurements are made from the bridge at all stages. The initial point for soundings is the inner face of the left abutment.

The gauge was read by R. T. Raven. Tables of daily gauge-height and discharge and monthly discharge will be computed during 1912 and published with the records for that year.

DISCHARGE MEASUREMENTS of Qu'Appelle River at Lumsden, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 17.....	W. H. Green.....	45.5	292.84	1.830		537.000
May 12.....	J. C. Keith.....	27.0	101.50	0.643	3.06	65.479
May 27.....	do	25.0	96.40	0.710	3.12	68.540
June 15.....	do	27.0	117.00	1.000	3.82	117.910*
July 11.....	do	25.0	79.01	0.370	2.50	28.920
Aug. 18.....	do	24.0	66.36	0.202	2.00	13.410
Oct. 6.....	do	24.0	67.53	0.210	2.07	14.300
Dec. 1.....	do		6.60	0.470	1.98	3.110

* Gauged at bridge.

QU'APPELLE RIVER AT FORT QU'APPELLE, SASK.

This station was established on July 26, 1911, by J. C. Keith. It is located at the traffic bridge on the N.W. 1/4 Sec. 7, Tp. 21, Rge. 13, W. 2nd Mer., and is between the Upper Fishing and the Lower Fishing Lakes.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the downstream face of the north abutment. The zero of the gauge (elev., 86.68) is referred to a permanent iron bench-mark (assumed elev., 100.00), situated 34 feet from the southwest corner of the bridge.

The channel is straight for about 50 feet above, but curves directly below the station. The right bank is high, while the left is low, and will overflow at high stages of the stream. The bed of the stream is sandy and partly covered with weeds. The fall is small, the current slow and the bed is, therefore, not liable to shift.

Discharge measurements are made from the bridge at all stages. The initial point for soundings is the inner face of the first pile at the north approach of the bridge.

The gauge was read by W. M. Thomson, but, as only three discharge measurements were made, there are not sufficient data to compute the daily discharges. It will be noted that the highest discharge was obtained at the lowest gauge-height. This is probably due largely to the weeds, but may also be partly due to the effect of the wind. It should also be noted that the mean velocities are very small, and the results are, therefore, not thoroughly reliable.

DISCHARGE MEASUREMENTS of Qu'Appelle River near Fort Qu'Appelle, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
July 25.....	J. C. Keith.....	67.0	163.32	0.17	2.63	28.57
Aug. 30.....	do	66.0	156.17	0.13	2.52	21.17
Oct. 12.....	do	66.0	154.37	0.28	2.50	42.59



Bridge over Qu'Appelle River near Katepwe, Sask Taken by J. C. Keith



Gauging Notukeu Creek with a 15-inch Weir. Taken by P. M. Sauder.

SESSIONAL PAPER No. 25d

MEAN DAILY GAUGE HEIGHT, in feet, of Qu'Appelle River near Fort Qu'Appelle, Sask., for 1911.

DAY.	July.	August.	Sept.	Oct.	Nov.
1		2.58	2.54	2.50	2.35
2		2.58	2.52	2.50	2.35
3		2.54	2.52	2.54	2.35
4		2.54	2.60	2.50	2.35
5		2.54	2.56	2.50	2.35
6		2.54	2.54	2.50	2.35
7		2.54	2.51	2.50	2.35
8		2.66	2.50	2.50	2.35
9		2.62	2.50	2.50	2.35
10		2.58	2.50	2.50	2.35
11		2.54	2.50	2.50	2.35
12		2.54	2.50	2.50	2.35
13		2.54	2.49	2.50	2.35
14		2.60	2.54	2.50	2.35
15		2.56	2.52	2.50	2.35
16		2.56	2.52	2.50	
17		2.56	2.52	2.50	
18		2.54	2.58	2.50	
19		2.54	2.52	2.50	
20		2.54	2.52	2.50	
21		2.60	2.52	2.46	
22		2.56	2.50	2.46	
23		2.54	2.50	2.44	
24		2.54	2.50	2.44	
25	2.63	2.52	2.54	2.42	
26	2.62	2.50	2.52	2.42	
27	2.64	2.58	2.52	2.42	
28	2.64	2.54	2.52	2.42	
29	2.60	2.52	2.50	2.42	
30	2.60	2.52	2.50	2.42	
31	2.60	2.52		2.35	

QU'APPELLE RIVER NEAR KATEPWE, SASK.

This station was established on July 27, 1911, by J. C. Keith. It is located at the traffic bridge on the N.E. $\frac{1}{4}$ Sec. 22, Tp. 19, Rge. 12, W. 2nd Mer., and is about half a mile below Lake Katepwe and twelve miles north of the town of Indian Head.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed near the downstream end of the north face of the centre pier. The zero of the gauge (elev., 89.83) is referred to a permanent iron bench-mark (assumed elev., 100.00), situated 73 feet from the southwest corner of the bridge.

The channel is straight for 100 feet above and below the station. The right bank is high, while the left is low and will overflow. The bed is sandy, and is almost covered with vegetation. The current is sluggish.

The cross-section at the gauge is not suitable, and discharge measurements are, therefore, made from the bridge on the S.E. $\frac{1}{4}$ Sec. 13, Tp. 19, Rge. 12, W. 2nd Mer., where there is a clean firm gravel bed. The initial point for soundings is a spike on the guard-rail marked "O."

The gauge was read by Clem Peltier, but as only three discharge measurements were made there is not sufficient data to compute the daily discharges. It will be noted that the discharges do not vary in accordance with the gauge-heights. This is probably due largely to the weeds, but may also be partly due to the effect of the wind. It should also be noted that the mean velocities are very small and the results are, therefore, not thoroughly reliable.

DISCHARGE MEASUREMENTS of Qu'Appelle River near Katepwe, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Fl. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
July 13.....	J. C. Keith.....	50.0	80.95	0.83		67.41
July 27.....	do	48.0	73.43	0.57	2.05	41.76x
Aug. 31.....	do	47.0	60.35	0.26	1.46	15.80*
Oct. 13.....	do	48.5	77.00	0.46	1.18	35.49*

x Gauge established.

* Gauged at bridge.

MEAN DAILY GAUGE HEIGHT, in feet, of Qu'Appelle River near Katepwe, Sask., for 1911.

Day	July.	August.	Sept.	Oct.	Nov.
1		2.04	1.42		1.06
2		2.03	1.40	1.54	1.04
3		2.03		1.54	1.00
4		2.02	1.37	1.55	0.96
5		2.02	1.32	1.53	
6			1.30	1.53	0.94
7		2.02	1.28	1.54	0.93
8		2.03	1.25		0.93
9		2.04	1.22	1.45	0.91
10		2.04		1.33	0.90
11		2.03	1.30	1.30	0.90
12		2.03	1.39	1.30	
13			1.44	1.22	0.91
14		2.01	1.49	1.16	0.90
15		1.94	1.53		0.89
16		1.96	1.55	1.15	
17		1.94		1.15	
18		1.91	1.55	1.14	
19		1.90	1.54	1.14	
20			1.54	1.13	
21		1.85	1.52	1.13	
22		1.83	1.52		
23		1.80	1.54	1.10	
24		1.75		1.08	
25		1.69	1.52	1.08	
26		1.65	1.54	1.05	
27	2.05		1.54	1.03	
28	2.05	1.60	1.53	1.00	
29	2.04	1.55	1.55		
30		1.49	1.52	1.10	
31	2.02	1.46		1.10	

MISCELLANEOUS DISCHARGE MEASUREMENTS of Qu'Appelle River Drainage Basin, in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. Feet.	Feet per Sec.	Sec.-Ft.
July 12.....	J. C. Keith..	Kaposvar Creek.	N.W. 7-21-3-2.	55.0	162.20	0.473	76.630
May 17	do	Qu'Appelle.....	S.W. 6-19-24-2	3.7	0.720	0.320	0.230
Aug. 28	do	do	do	7.0	1.530	0.238	0.364
Oct. 9.....	do	do	do	2.5	0.158	0.270	0.043

MOOSEJAW CREEK DRAINAGE BASIN.

General Description.

Moosejaw Creek rises in the vicinity of Yellowgrass and flows in a northwesterly direction until it reaches the city of Moosejaw, and thence in an easterly and northerly direction, finally emptying into the Qu'Appelle River near Buffalo Pound Lake. From the head-waters to the city of Moosejaw, the drainage area is estimated at about one thousand eight hundred and thirty square miles. This area is almost entirely devoid of tree growth, except that the valley is lined with brush in the vicinity of Moosejaw.

Throughout its entire length the creek flows in a very crooked but well defined channel. The upper portion of the valley is small, being merely a depression, but it gradually increases in size until at Drinkwater it is about thirty feet deep and at Moosejaw about eighty feet deep. The fall in the creek is very small, particularly so between Drinkwater and Moosejaw, where the total fall is only 67.5 feet, or an average of 2.3 feet per mile of valley.

The Canadian Pacific Railway Company has dams at Milestone, Rouleau, Drinkwater, two at Moosejaw and one at Pasque. There is also a municipality dam in Sec. 19, Tp. 15, Rge. 24, W. 2nd Mer., which supplies water to the neighbourhood in periods when there is no flow in the creek. The amount of water diverted in each case is small, as the Canadian Pacific Railway use the water only to operate their railway, and only a small quantity of stock has been watered at the municipal dam during late years.

SESSIONAL PAPER No. 25d

MOOSEJAW CREEK NEAR LANG, SASK.

This station was established on June 21, 1911, by J. C. Keith. It is located at the traffic bridge on the road allowance east of the N.E. ¼ Sec. 24, Tp. 11, Rge. 19, W. 2nd Mer., and is four miles west of the village of Lang.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the downstream face of the centre row of piles. The zero of the gauge (elev., 94.80) is referred to the top of a pile (assumed elev., 100.00) on the downstream side of the south approach of the bridge.

The channel is straight for 200 feet above and 150 feet below the station. Both banks are low and overflow in high stages of the stream. The bed of the stream is composed of clay, and in summer, when the stream is very low, becomes overgrown with vegetation. The current is sluggish at all stages.

Discharge measurements are made from the bridge in high stages of the stream and by wading or with a weir at some other section during low stages. The initial point for soundings at the bridge is the inner face of the south abutment.

The gauge was read by Miss Irene Irvine.

DISCHARGE MEASUREMENTS of Moosejaw Creek near Lang, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Fl. per sec.	Feet.	Sec.-ft.
May 30.....	J. C. Keith.....	49 0	57.45	0.579		33.27
June 21.....	do	10.0	4.55	0.360	1.84	1.64
July 17.....	do	11 6	14.28	0.270	2.43	3.85
Aug. 22.....	do	12.0	13.24	0.210	2.28	2.80
Oct. 17.....	do	17.5	17.00	0.245	2.46	4.18

DAILY GAUGE HEIGHT AND DISCHARGE of Moosejaw Creek near Lang, Sask., for 1911.

DAY.	June.		July.		August.		September.		October.	
	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge	Gauge Height	Dis-charge	Gauge Height.	Dis-charge
	Feet	Sec.-ft	Feet.-	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1.80	1.6	2.56	5.3	2.21	2.5	1.99	1 9
2.			1.79	1.6	2.57	5.4	2.20	2.5	2 05	2 1
3.			1.78	1.6	2.58	5.5	2.19	2.5	2.10	2 2
4.			1.77	1.5	2.59	5.6	2.16	2.4	2.15	2 4
5			2.00	2.0	2.61	5.8	2.16	2.4	2.20	2 5
6.			2.05	2 1	2.63	6.1	2 15	2.4	2 21	2 5
7.			2.20	2 5	2.63	6.1	2 14	2.3	2.30	2 9
8.			2.30	2 9	2.76	7.8	2 13	2.3	2.35	3 2
9.			2 50	4 6	2.65	6.4	2 13	2.3	2.35	3 2
10.			2 50	4 6	2.76	7.8	2 14	2.3	2.35	3 2
11			2.45	4.1	2.74	7 6	2.15	2.4	2.36	3 3
12.			2.45	4.1	2.78	8 0	2.16	2.4	2 37	3 4
13			2.45	4.1	2 69	6 9	2.17	2.4	2.40	3 6
14.			2.41	3 7	2.66	6 5	2.18	2.4	2.40	3 6
15.			2.40	3.6	2.60	5 7	2.18	2.4	2.41	3 7
16.			2 40	3.6	2.58	5 5	2.19	2 5	2.41	3 7
17.			2.45	4.1	2.56	5 3	2.19	2 5	2.46	4 2
18.			2.44	4.0	2.54	5 0	2 18	2.4	2.49	4 5
19.			2.44	4 0	2.52	4.8	2.16	2.4	2.51	4 7
20			2 50	4.6	2.41	3.7	2.14	2.3	2.52	4 8
21.	1.84	1.7	2.50	4.6	2.30	2.9	2.10	2.2	2.55	5 2
22.	1.80	1.6	2.50	4.6	2.30	2.9	2.07	2.1	2.57	5 4
23.	1.75	1 5	2 55	5.2	2.25	2.7	2 05	2.1	2.58	5 5
24.	1.76	1.5	2.55	5 2	2.25	2 5	2.03	2.1	2.59	5 6
25.	1.75	1.5	2.55	5 2	2 20	2.5	2.01	2.0	2.60	5 7
26.	1.70	1.4	2 55	5.2	2.25	2.7	2.00	2.0	2.61	5 8
27.	1.65	1 4	2.55	5 2	2.26	2.7	2.00	2.0	2.61	5 8
28.	1.65	1.4	2.55	5 2	2.25	2.7	1.99	2.0	2.61	5 8
29	1.61	1.3	2.55	5 2	2.24	2.7	1 96	1.9	*	
30.	1.61	1 3	2 55	5.2	2.24	2.7	1.93	1.9		
31			2 55	5 2	2.22	2.6				

* Creek frozen over.

MONTHLY DISCHARGE of Moosejaw Creek near Lang, Sask., for 1911.
(Drainage area, 189 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June (21-30)...	1.7	1.3	1.46	0.008	0.003	29
July.....	5.2	1.5	3.90	0.021	0.024	240
August.....	8.0	2.5	4.88	0.026	0.030	300
September	2.5	1.9	2.28	0.012	0.013	136
October (1-28).	5.8	1.9	3.94	0.021	0.022	219
The period....					0.092	924

MOOSEJAW CREEK AT BRYCE'S FARM, SASK.

This station was established on April 13, 1910, by P. M. Sauder. It is located at the traffic bridge on the road allowance east of the N.E. ¼ Sec. 15, Tp. 15, Rge. 25, W. 2nd Mer., and is about seventeen and one half miles southeast of Moosejaw.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a pile on the downstream side of the bridge. The zero of the gauge (elev., 87.29) is referred to a permanent iron bench-mark (assumed elev., 100.00), situated on the left bank 51 feet downstream from the bridge.

The channel is straight for 200 feet above and 100 feet below the station. The right bank is partly covered with brush, and overflows during flood stages of the stream. The left bank is also partly covered with brush, but is high and not liable to overflow. The bed is composed of soft clay (mud), but is free from vegetation and is not liable to shift except during very high water.

Discharge measurements are made from the bridge during high water. The initial point for soundings is the south end of the hand-rail of the bridge. During low water the discharge is measured by wading or with a weir near the bridge.

During 1911, the gauge was read by W. F. Bryce from April 9 to June 3, and by Gerry Chevrier from June 25 to November 11.

DISCHARGE MEASUREMENTS of Moosejaw Creek at Bryce's Farm, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
April 22.....	W. H. Greene.....	84.3	329.00	0.969	7.39	318.48
May 2.....	J. C. Keith.....	67.5	118.57	0.600	4.67	71.20
May 20.....	do	57.5	51.59	0.620	3.54	32.20
May 29.....	do	64.0	97.22	0.633	4.30	61.58
June 19.....	do	28.5	13.57	0.560	2.70	7.55
July 3.....	do	27.5	11.87	0.380	2.66	4.71
Sept. 1.....	do					Nil.
Oct. 10.....	do	63.0	102.08	0.470	4.32	48.38a

a. Channel choked with grass.

SESSIONAL PAPER No. 25d

DAILY GAUGE HEIGHT AND DISCHARGE of Moosejaw Creek at Bryce's Farm, Sask., for 1911.

DAY.	April.		May		June.		July.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			5.0	90.0	5.70	132.0	2 70	6 7
2			4.7	75.0	6.50	201.0	2 55	3 3
3			4.5	66.0	7.20	290.0	2 60	4 4
4			4.3	58.0	†		2 60	4 4
5			2.9	12.0			2 60	4 4
6			2.5	2.3			2 50	2 3
7			2.4	1.3			2 70	6 7
8			2.3	0.5			2 70	6 7
9	7.6	352	2.2	Nil			2 75	7 9
10	7.8	384	2.0	"			2 75	7 9
11	7.7	368	2.0	"			2 60	4 4
12	7.6	352	2.0	"			2 60	4 4
13	7.6	352	2.0	"			2 60	4 4
14	6.9	248	2.4	1.3			2 60	4 4
15	7.0	262	2.2	0.0			2 60	4 4
16	7.3	305	2.0	0.0			2 70	6 7
17	7.4	320	2.4	1.3			2 70	6 7
18	7.7	368	2.8	9.3	†		2 60	4 4
19	7.7	368	3.1	18.0	2.70	6.7	2 55	3 3
20	7.5	336	3.5	30.0	2 60	4.4	2 50	2 3
21	7.5	336	4.1	50.0	2.55	3.3	2 50	2 3
22	7.4	320	4.5	66.0	2.50	2.3	2 50	2 3
23	7.1	276	4.5	66.0	2.50	2.3	2 65	5.6
24	6.6	212	4.5	66.0	2.60	4.4	2 70	6.7
25	6.3	181	4.3	58.0	3.00	15.0	2 70	6 7
26	6.1	163	4.2	54.0	2.90	12.0	2 60	4 4
27	5.7	132	3.8	39.0	2.85	11.0	2 50	2 3
28	5.5	118	4.0	46.0	2.80	9.3	2 50	2 3
29	5.5	118	4.3	58.0	2.90	12.0	2 45	1 8
30	5.3	106	4.4	62.0	2.80	9.3	2 40	1 3
31			5.0	90.0			2 35	0 9

DAILY GAUGE HEIGHT AND DISCHARGE of Moosejaw Creek at Bryce's Farm, Sask., for 1911. — *Con.*

DAY.	August.		September.		October.		November.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge.
	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2.30	0.5	Dry	Nil	Dry	Nil	2.30	0.5
2.	2.30	0.5	"	"	"	"	2.30	0.5
3.	2.30	0.5	"	"	0.60	"	2.25	0.2
4.	2.30	0.5	"	"	0.50	"	2.25	0.2
5.	2.30	0.5	"	"	0.40	"	2.20	Nil
6.	2.30	0.5	"	"	0.00	"	2.00	"
7.	2.20	0.0	"	"	0.00	"	2.00	"
8.	2.35	0.9	"	"	Dry	"	2.00	"
9.	2.30	0.5	"	"	3.95	35.0	2.00	"
10.	2.30	0.5	"	"	4.30	47.0	1.90	"
11.	2.25	0.2	"	"	4.00	37.0	1.90	"
12.	2.11	Nil	"	"	3.70	27.0		
13.	1.80	"	"	"	3.50	21.0		
14.	1.50	"	"	"	3.35	17.0		
15.	1.20	"	"	"	3.00	10.0		
16.	1.00	"	"	"	2.90	8.0		
17.	0.00	"	"	"	2.90	8.0		
18.	0.70	"	"	"	2.80	6.0		
19.	Dry	"	"	"	2.80	6.0		
20.	"	"	"	"	2.70	4.6		
21.	"	"	"	"	2.70	4.6		
22.	"	"	"	"	2.70	4.6		
23.	"	"	"	"	2.70	4.6		
24.	"	"	"	"	2.65	4.0		
25.	"	"	"	"	2.60	3.4		
26.	"	"	"	"	2.60	3.4		
27.	"	"	"	"	2.55	3.0		
28.	"	"	"	"	2.50	2.3		
29.	"	"	"	"	2.51	2.3		
30.	"	"	"	"	2.40	1.3		
31.	"	"	"	"	2.40	1.3		

† No observer from June 4 to 18.
* Changing conditions. Oct. 8—Oct. 28.
‡ Used hydrographer's gauge-height.

MONTHLY DISCHARGE of Moosejaw Creek at Bryce's Farm, Sask., for 1911.
(Drainage area, 1350 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (9-30)	384.0	106.0	272.00	0.202	0.165	11,855
May	90.0	00.0	32.90	0.024	0.028	2,023
June	290.0	00.0	47.60	0.035	0.020	1,416
July.....	7.9	0.9	4.41	0.003	0.003	271
August	0.9	0.0	0.16	0.000	0.000	10
September.....	0.0	0.0	0.00	0.000	0.000	00
October	47.0	0.0	8.43	0.006	0.007	518
November 1-11	0.5	0.0	0.13	0.000	0.000	3
The period					0.223	16,096

MOOSEJAW CREEK AT MCCARTHY'S FARM, SASK.

This station was established on April 7, 1910, by P. M. Sauder and W. H. Greene. It is located at the traffic bridge on the N.W. ¼ Sec. 16, Tp. 16, Rge. 26, W. 2nd Mer., and is three miles south of Moosejaw post office.

SESSIONAL PAPER No. 25d

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the inner face of the right abutment. The zero of the gauge (elev., 83.03) is referred to a permanent iron bench-mark (assumed elev., 100.00), situated 33.5 feet northeast of the gauge.

The stream flows in one channel, which is straight for about 100 feet above and 300 feet below the station. The right bank is high, slightly wooded, and not liable to overflow. The left bank is low, partly wooded, and liable to overflow. The bed of the stream is composed of mud at the bridge, but a short distance below it is composed of gravel, and is not liable to shift except during high water.

During high water discharge measurements are made from the downstream side of the bridge, but in low water they are made by wading at a section about 30 feet downstream. The initial point for soundings is at the west end of the hand-rail of the bridge.

The gauge was read during 1911 by V. J. McCarthy and members of his household.

DISCHARGE MEASUREMENTS of Moosejaw Creek at McCarthy's Ranche, Sask., in 1911.

Date.	Hydrographer	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 28..	G. H. Whyte.	32 0	68.75	0.420	1.63	28.720
May 2	J. C. Keith...	32 0	77 04	1.454	1.91	112.040
April 21	W. H. Greene	33.0	137.27	2.599	3.52	356.810
May 9	J. C. Keith.	16 5	6.42	0.593	0.63	3.810
May 20	do	17 5	7.32	0.740	0.65	5.400
May 29	do	32 0	57.98	0.788	1.25	45.750
June 5.	do	49 0	140.94	2.269	3.20	282.450
June 19	do	25.0	11.90	0.840	0.77	9.970
July 3	do	20.0	7.28	0.800	0.68	5.830
July 22	do	17.3	3.70	0.370	0.51	1.380
Sept. 1	do				0.37	Nil.
Oct. 11	do	16 5	4.07	0.270	0.52	Nil.
Dec. 4	do	9 0	4 17	0.224	0 55	0.919
Dec 19	do	4.3	0.87	0.430	0.51	0.376

DAILY GAUGE HEIGHT AND DISCHARGE of Moosejaw Creek at McCarthy's Ranche, Sask., for 1911.

DAY	March.		April.		May.		June.		July.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			1.08	29	2 02	123.0	1 57	75 0	0 97	21.0
2			1 08	29	1.92	112.0	1.99	120 0	0 76	9.3
3			1 08	29	1 77	96 0	2.48	181 0	0 68	6.1
4			1 08	29	1 60	78.0	2 97	250 0	0 65	5.2
5			1.08	29	1 33	51.0	3.18	285 0	0 64	4.8
6.			1.08	29	0 96	21.0	3 11	273 0	0 59	3.2
7.			1.07	29	0 76	9.3	2 74	217 0	0 57	2.8
8.			1.06	28	0 70	6.8	2 29	156 0	0 55	2.2
9.			1.16	36	0 68	6.1	1 84	103 0	0 54	2.0
10.			2.25	152	0 63	4 5	1 67	85 0	0 54	2.0
11.			2.90	240	0 60	3.5	1 53	70 0	0 58	3.0
12.			3.22	295	0 58	3.0	1 34	52 0	0 58	3.0
13.			3.32	311	0 58	3.0	1 22	41 0	0 56	2.5
14.			2.97	250	0 56	2.5	1 19	38 0	0 54	2.0
15			2.78	222	0 54	2.0	1 14	34 0	0 52	1.5
16			2.99	254	0 60	3.5	1 04	26 0	0 47	0.7
17.			3.13	276	0 62	4.2	0 93	19 0	0 47	0.7
18.			3.34	314	0 60	3 5	0 82	12 0	0 49	0.9
19.	1 57	24 0	3.54	354	0 60	3.5	0 78	10 0	0 49	0.9
20.	1 64	29 5	3.61	365	0 65	5.2	0 77	9 7	0 50	1.0
21.	1 82	45 0	3.54	352	0 90	17.0	0 72	7 6	0 50	1.0
22.	2 09	72 0	3.49	342	1 18	37.0	0 67	5 8	0 53	1.8
23	1 72	36 0	3.44	333	1 46	63.0	0 64	4 8	0 55	2.2
24	1 48	18 0	3.22	293	1 53	70.0	0 66	5 5	0 54	2.0
25	1 56	24 0	3.03	260	1 54	71.0	0 69	6 5	0 51	1.2
26.	1 72	36 0	2.73	215	1 51	68.0	0 69	6 5	0 49	0.9
27..	1 84	47 0	2.53	188	1 56	74.0	0 72	7 4	0 47	0 7
28..	1 55	23 0	2.35	164	1 40	57.0	0 80	11 0	0 46	0.6
29..	1 32	20 0	2.21	146	1 27	45.0	0 74	8 5	0 45	0.5
30..	1 15	21 0	2.10	133	1 45	62.0	0 75	8 9	0 45	0.5
31.	1 08	29 0			1 48	65 0			0 45	0.5

DAILY GAUGE HEIGHT AND DISCHARGE of Moosejaw Creek at McCarthy's Ranche, Sask., for 1911.
Continued.

DAY.	August.		September.		October.		November.		December.	
	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge	Gauge Height	Dis-charge.
	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0 44	0 4	0 38	Nil	0 38	Nil	0 74	8 5	0 57	1.50
2	0 44	0 4	0 38	"	0 40	"	0 74	8 5	0 56	1.30
3	0 43	0 3	0 37	"	0 48	0 8	0 74	8 5	0 57	1.40
4	0 43	0 3	0 38	"	0 55	2 2	0 74	8 5	0 55	0 92
5	0 42	0 2	0 40	"	0 56	2 5	0 72	7 6	0 54	0 81
6	0 42	0 2	0 40	"	0 55	2 2	0 69	6 5	0 55	0 92
7	0 43	0 3	0 40	"	0 55	2 2	0 65	4 9	0 55	0 91
8	0 48	0 8	0 40	"	0 60	3 5	0 65	4 8	0 53	0 72
9	0 46	0 6	0 42	0 2	0 62	4 2	0 64	4 5	0 51	0 41
10	0 45	0 5	0 42	0 2	0 56	2 5	0 64	4 4	0 55	0 80
11	0 45	0 5	0 44	0 4	0 79	10 0	0 65	4 8	0 55	0 78
12	0 45	0 5	0 43	0 3	1 20	39 0	0 63	4 2	0 54	0 64
13	0 44	0 4	0 44	0 4	1 16	36 0	0 63	4 1	0 52	0 50
14	0 43	0 3	0 44	0 4	1 08	29 0	0 62	3 8	0 52	0 49
15	0 43	0 3	0 43	0 3	1 07	29 0	0 62	3 7	0 52	0 46
16	0 42	0 2	0 42	0 2	1 03	25 0	0 62	3 6	0 52	0 48
17	0 42	0 2	0 41	0 1	0 94	19 0	0 62	3 6	0 52	0 48
18	0 40	0 0	0 40	Nil	0 90	17 0	0 61	3 2	0 52	0 45
19	0 38	Nil	0 40	"	0 85	14 0	0 60	2 9	0 51	0 38
20	0 37	"	0 40	"	0 80	11 0	0 60	2 8	0 51	0 40
21	0 39	"	0 38	"	0 77	9 7	0 60	2 9	0 51	0 38
22	0 36	"	0 37	"	0 75	8 9	0 59	2 6	0 51	0 37
23	0 35	"	0 40	"	0 78	10 0	0 60	2 5	0 50	0 29
24	0 35	"	0 39	"	0 79	10 0	0 60	2 5	0 50	0 28
25	0 35	"	0 39	"	0 80	11 0	0 58	2 1	0 49	0 22
26	0 36	"	0 38	"	0 80	11 0	0 58	2 0	0 48	0 19
27	0 39	"	0 38	"	0 79	10 0	0 57	1 7	0 47	0 14
28	0 37	"	0 38	"	0 78	10 0	0 56	1 5	0 46	0 11
29	0 38	"	0 38	"	0 76	9 3	0 57	1 7	0 46	0 09
30	0 40	"	0 38	"	0 76	9 3	0 57	1 6	0 47	0 10
31	0 38	"			0 76	9 3			0 46	0 08

Gauge-heights for November and December interpolated.

MONTHLY DISCHARGE of Moosejaw Creek at McCarthy's Ranche, Sask., for 1911.
(Drainage area, 1790 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total In Acre-feet.
March (19-31)	72 0	0 70	31 90	0.0180	0.0090	8225
April	365.0	29 00	188 00	0 1060	0.1180	11187
May	123.0	2 00	37 80	0 0210	0.0240	2324
June	285.0	4 80	71 00	0 0390	0.0440	4225
July	21.0	0 50	2 80	0.0020	0.0020	172
August	0.8	0 00	0 21	0.0000	0.0000	13
September	0.4	0 00	0 08	0 0000	0.0000	5
October	39.0	0 00	11 50	0 0060	0.0070	707
November (28 days)	8.5	1 60	4 15	0 0020	0.0020	247
December	1.5	0 08	0 55	0.0003	0.0003	33
The period					2063	27138

SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS of Moosejaw Creek Drainage Basin, in 1911.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. Feet.</i>	<i>Feet per Sec.</i>	<i>Sec.-Ft.</i>
June 14. .	J. C. Keith .	Moosejaw Creek	Sec. 34-16-26-2	35.5	33.74	1.540	52.07
June 17.....	do	do	do	35.5	15.040	0.977	14.70

SOURIS RIVER DRAINAGE BASIN.

General Description.

The Source of Souris River is in marshes near Yellowgrass, Saskatchewan. From here it flows in a southeasterly direction, almost parallelling the Soo Line of the Canadian Pacific Railway to Estevan, where a loop crosses the International boundary in Range 34, west of the Principal Meridian. After making a loop into North Dakota it recrosses the International Boundary in Range 27, west of the Principal Meridian, and flows in a northeasterly direction to Souris, Manitoba, where it turns east and finally joins the Assiniboine River in Tp. 8, Rge. 16, W. 1st Mer.

This stream drains a large tract of typical Western Plains. The rain-fall will probably average very little over fifteen inches, and is usually sufficiently divided over the year to prevent excessive run-off, or floods. At times when there is an unusual amount of rain-fall and in the early spring, the water drains into the streams very rapidly and causes a flood of short duration.

There are towns, villages and farms all along the course of this stream and its tributaries which depend on it for a domestic and industrial water-supply. In North Dakota it has been proposed to divert water for irrigation purposes.

LONG CREEK NEAR ESTEVAN, SASK.

This station was established on June 22, 1911, by J. C. Keith. It is located on the S.E. $\frac{1}{4}$ Sec. 10, Tp. 2, Rge. 8, W. 2nd Mer., and is about half a mile above the mouth of the creek and about two and a half miles south of the town of Estevan.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the shore face of the first row of piles from the north end of the bridge. The zero of the gauge (elev., 83.87) is referred to a permanent iron bench-mark (assumed elev., 100.00) on the right bank near the end of the bridge.

The channel is straight for 100 feet above and below the station. Both banks are steep, but are liable to be flooded during very high stages of the stream. Both are also covered with brush. The bed of the stream is composed of clean gravel, which is not liable to shift. The current is sluggish.

During high water, discharge measurements are made from the bridge, but during low stages a wading section elsewhere, where the current is swifter, must be used. The initial point for soundings at the bridge is the inner face of the left abutment.

The gauge was read by Mr. George Pawson, but as only a few gaugings were made, the daily discharges cannot be computed.

DISCHARGE MEASUREMENTS of Long Creek near Estevan, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 22.	J. C. Keith.....	23.0	28.01	0.395	1.445	11.19x
July 18.	do .	10.5	2.80	0.610	0.810	1.71*
Aug. 23.....	do	5.6	1.44	0.430	0.720	0.62*
Oct. 18.....	do	34.5	116.13	0.750	3.350	86.80s

x Gauge established.

* Measured at wading section.

Measured at Pawson's bridge.

MEAN DAILY GAUGE HEIGHT, in feet, of Long Creek near Estevan, Sask., for 1911.

DAY.	June.	July.	August	Sept.	Oct.
1		1.16	0 69	0 69	0.75
2		1.10	0 69	0 68	0.95
3		1.08	0 80	0 67	0.93
4		1.06	0 76	0 67	0.90
5		1.04	0 75	0 69	0.86
6		0.99	0 75	0 61	0.82
7		0.95	0 74	0 72	0.82
8		1.03	0 74	0 75	0.79
9		0.95	0 74	0 72	0.76
10		0.95	0 74	0 70	0.76
11		0.92	0 71	0 67	0.75
12		0.90	0 73	0 67	0.75
13		0.85	0 72	0 67	0.75
14		0.83	0 72	0 67	0.75
15		0.85	0 72	0 67	0.73
16		0.83	0 82	0 68	0.73
17		0.81	0 80	0 68	3.20
18		0.81	0 78	0 68	3.40
19		0.85	0 76	0 68	3.20
20		0.82	0 75	0 69	3.04
21		0.80	0 76	0 71	2.90
22	1.44	0.76	0 75	0 71	2.75
23	1.44	0.81	0 72	0 74	2.62
24	1.44	0.79	0 71	0 81	2.48
25	1.42	0.75	0 71	0 76	2.35
26	1.39	0.71	0 71	0 76	2.25
27	1.36	0.71	0 73	0 75	2.20
28	1.35	0.71	0 72	0 76	2.13
29	1.29	0.70	0 71	0 84	1.95
30	1.21	0.70	0 71	0 75	1.90
31		0.69	0 90		

SOURIS RIVER NEAR ESTEVAN, SASK.

This station was established on June 23, 1911, by J. C. Keith. It is located about 50 feet below the Canadian Pacific Railway Company's dam on the N.E. $\frac{1}{4}$ Sec. 11, Tp. 2, Rge. 8, W. 2nd Mer., and is about two miles south and three-quarters of a mile east of the town of Estevan, and about three-quarters of a mile below the mouth of Long Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a heavy timber sunk in, and anchored to, the left bank. The zero of the gauge (elev., 82.45) is referred to a permanent iron bench-mark (assumed elev., 100.00) on the right bank and about 47 feet southeast of the end of the Canadian Pacific Railway dam.

The channel is straight for about 100 feet above and below the gauge. Both banks are steep, but become submerged in very high water. Both are also covered with brush. The bed of the stream is covered with cinders from the Canadian Pacific Railway power-house and is hard and permanent.

Discharge measurements can be made only by wading at the gauge, as the cross-sections at the bridges in that locality are affected by back-water. The flood discharge is estimated by use of suitable weir formulae for the dam above.

The gauge was read by Mr. William Bevan, but as only a few discharge measurements were made the daily discharges cannot be computed.

DISCHARGE MEASUREMENTS of Souris River near Estevan, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
June 23	J. C. Keith.....	14.4	7.61	1.59	1.36	12.130x
July 18.....	do	10.0	2.64	1.17	0.98	3.100x
Aug. 23.....	do	7.1	1.43	0.69	0.79	0.997x

x Measured 50 feet below C.P.R. dam.

SESSIONAL PAPER No. 25d

MEAN DAILY GAUGE HEIGHT, in feet, of Souris River near Estevan, Sask., for 1911.

DAY.	June.	July.	August.	Sept.	Oct.	Nov.
1.....		1 08	0 75	0 74	1 08	2.05
2.....		1 02	0 75	0 75	1 10	2.04
3.....		1 00	0 88	0 76	1 60	2.00
4.....		1 00	0 90	0 76	1 65	1.90
5.....		0 94	0 88	0 74	1 64	1.87
6.....		0 90	0 90	0 77	1 60	1.64
7.....		0 89	0 91	0 76	1 50	1.48
8.....		1 70	0 93	0 78	1 50	1.40
9.....		1 67	0 89	0 81	1 48	1.44
10.....		1 37	0 88	0 81	1 40	1.38
11...		1 07	0 86	0 82	1 35	1.35
12.....		1 03	0 85	0 86	1 30	1.34
13.....		1 00	0 83	0 86	1 28	1.30
14.....		0 97	0 81	0 88	1 26	1.28
15...		0 97	0 85	0 87	1 22	1.27
16.....		0 97	1 04	0 87	1 20	
17.....		0 91	1 00	0 89	3 20	
18.....		0 98	0 91	0 90	3 00	
19.....		0 98	0 92	0 90	3 34	
20.....		0 99	0 86	0 92	3 10	
21.....		0 99	0 85	0 93	3 10	
22.....		1 01	0 82	0 95	3 05	
23.....	1.37	1 02	0 79	0 95	3 01	
24.....	1.35	1 00	0 78	0 95	2 95	
25.....	1.50	0 98	0 76	0 97	2 87	
26.....	1 40	0 87	0 75	0 98	2 72	
27.....	1.37	0 87	0 79	1 00	2 40	
28.....	1.37	0 84	0 76	1 02	2 17	
29.....	1.32	0 84	0 75	1 04	2 12	
30.....	1 20	0 76	0 75	1 07	2 10	
31.....		0 76	0 74		2 10	

SOURIS RIVER NEAR GLEN EWEN, SASK.

This station was established on June 26, 1911, by J. C. Keith. It is located near D. F. Preston's house on the N.E. ¼ Sec. 36, Tp. 2, Rge. 1, W. 2nd Mer., and is about three miles south and half a mile east of Glen Ewen.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post sunk in the bed of the stream at the left bank. The zero (elev., 79.98) is referred to a permanent iron bench-mark (assumed elev., 100.00) on the left bank and within a few feet of the gauge.

The channel is slightly curved for some distance above and below the gauge. Both banks are steep, but will overflow in very high stages of the stream. Both are partly covered with woods. The bed of the stream is composed of clean sand and gravel, and may shift during high water. Beavers may affect the records at the gauge by building dams and causing back-water.

Discharge measurements are made during ordinary stages by wading at a point about 400 yards below the gauge. During high-water stages, they are made at the traffic bridge on the road allowance east of Sec. 2, Tp. 3, Rge. 1, W. 2nd Mer.

The gauge was read by Mr. D. F. Preston, but as only a few gaugings were made, there are not sufficient data to compute the daily discharge.

DISCHARGE MEASUREMENTS of Souris River near Glen Ewen, Sask., in 1911.

Date.	Hydrographer.	Width.	Area of Section	Mean Velocity	Gauge Height.	Dischaage.
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
June 26.....	J. C. Keith.....	49.0	52.89	0.51	2.000	27.090x
July 19.....	do	30.5	14.80	0.86	1.755	12.790
Aug. 24.....	do	29.0	10.54	0.70	1.630	5.257
Oct. 19.....	do	45.5	31.17	1.07	2.350	33.520*

x Gauge established.
* Gauged at ford.

MEAN DAILY GAUGE HEIGHT, in feet, of Souris River near Glen Ewen, Sask., for 1911.

DAY.	June.	July.	August.	Sept.	Oct.	Nov.
1			1.62	1.57	2.06	2 42
2		2.05	1.66	1.56	2.08	2 52
3		1.98	1.70	1.58	2.26	2 40
4		1.95	1.75	1.57	2.40	2 34
5		1.86	1.85	1.57	2.43	2 34
6		1.85	1.79	1.58	2.42	2 33
7		1.79	1.77	1.58	2.50	2 32
8		1.79	1.75	1.58	2.50	2 29
9		1.76	1.78	1.61	2.45	2 17
10		1.69	1.83	1.67	2.50	2 28
11		1.67	1.83	1.68	2.50	2 25
12		1.66	1.82	1.70	2.47	2 24
13		1.65	1.83	1.73	2.45	2 28
14		1.65	1.85	1.77	2.45	2 23
15		1.64	1.83	1.76	2.45	2 20
16		1.64	1.79	1.77	2.44	
17		1.64	1.78	1.75	2.40	
18		1.70	1.77	1.75	2.36	
19		1.74	1.75	1.76	2.35	
20		1.73	1.70	1.87	2.34	
21		1.72	1.69	1.91	2.31	
22		1.70	1.68	1.95	2.34	
23		1.75	1.65	2.00	2.79	
24		1.75	1.64	2.00	2.85	
25		1.76	1.63	2.04	2.83	
26	2 00	1.75	1.57	2.02	2.80	
27	1 98	1.75	1.57	2 05	2.79	
28	1.96	1.70	1.57	2.06	3.04	
29	2.05	1.69	1.56	2.02	2.55	
30	2.10	1.66	1.57	2.05	3.00	
31	2.11	1.62	1.57		2.49	

SOURIS RIVER NEAR MELITA, MAN.

This station was established on July 20, 1911, by J. C. Keith. It is located at the traffic bridge on Sec. 6, Tp. 4, Rge. 26, W. 1st Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a pile on the downstream side of the bridge. The zero of the gauge (elev., 84.02) is referred to a permanent iron bench-mark assumed elev., 100.00), on the right bank about fifty feet from the end of the bridge.

The channel is straight for a distance above the station, but curves to the right a short distance below. The banks are high and partly wooded. The bed of the stream is composed of clean sand and gravel, which may shift during high water.

Discharge measurements are made from the bridge, except during extreme low water, when they are made by wading.

The gauge was read by Mrs. Andrew Lawson, but as only a few gaugings were made, the daily discharges cannot be computed.

DISCHARGE MEASUREMENTS of Souris River at Melita, Man., in 1911.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Fl. per sec.	Feet.	Sec.-ft.
June 30.....	J. C. Keith.....	76.0	137.70	0.410	2.02	56 45*
July 20.....	do	72.0	107.65	0.230	1.55	24.83*
Aug. 25.....	do	52.0	48.25	0.704	1.57	33.96
Oct. 20.....	do	54 0	45.16	0.890	1.62	40 39x

x Measured at wading section.
* Measured at bridge.

SESSIONAL PAPER No. 25d

MEAN DAILY GAUGE HEIGHT, in feet, of Souris River at Melita, Man, for 1911.

DAY.	July.	August.	Sept.	Oct.	Nov.
1		1.40	1.66	1.98	1.51
2		1.41	1.66	1.99	1.51
3		1.42	1.68	2.00	1.51
4		1.70	1.68	2.00	1.51
5		1.69	1.68	2.00	1.51
6		1.55	1.68	2.00	1.51
7		1.56	1.68	2.00	1.51
8		1.59	1.69	1.82	1.51
9		1.57	1.69	1.82	1.51
10		1.57	1.69	1.81	1.51
11		1.56	1.62	1.80	1.51
12		1.55	1.64	1.80	1.51
13		1.52	1.69	1.80	1.51
14		1.50	1.70	1.85	1.51
15		1.50	1.80	1.76	1.51
16		1.51	1.86	1.75	
17		1.52	1.89	1.73	
18		1.52	1.87	1.70	
19		1.51	1.87	1.66	
20	1.55	1.60	1.88	1.62	
21	1.54	1.59	1.87	1.56	
22	1.56	1.59	1.88	1.59	
23	1.58	1.57	1.88	1.57	
24	1.53	1.57	1.65	1.57	
25	1.50	1.57	1.65	1.55	
26	1.49	1.57	1.66	1.55	
27	1.48	1.59	1.66	1.55	
28	1.46	1.62	1.66	1.73	
29	1.46	1.66	1.66	1.54	
30	1.40	1.66	1.68	1.52	
31	1.40	1.67	....	1.52	

MISCELLANEOUS DISCHARGE MEASUREMENTS of Souris Drainage Basin, in 1911.

DATE.	Hydrographer	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. Feet.</i>	<i>Feet per Sec.</i>	<i>Sec.-Ft.</i>
June 27.....	J. C. Keith	Graham Creek..	Sec. 2-4-27-1				* 0.070
June 24.....	do	Moose Mountain Creek	Sec. 22-3-2-2....	39.5	17.69	0.61	10.830
June 27	do	North Antler Creek.....	Sec. 3-3-1-2	1.6	0.17	0.35	0.060
June 27.....	do	South Antler Creek.....	Sec. 6-3-32-1....	3.3	0.53	0.67	0.359

* Approximate.

APPENDIX No. 1.

REPORT ON THE FIELD-WORK IN THE WOOD MOUNTAIN DISTRICT, DURING 1911, BY N. M. SUTHERLAND, DISTRICT HYDROGRAPHER.

On May 23, 1911, I proceeded to Maple Creek, Saskatchewan, where I received my camp outfit including horses, etc., from Mr. R. J. Burley.

One June 6th we left Maple Creek and proceeded along the Canadian Pacific Railway to Swift Current, arriving there on June 10th. At Swift Current, we met Mr. P. M. Sauder and accompanied by him, we left Swift Current on June 11th.

We at first travelled south from Swift Current and inspected Pierce, Notukeu and Bull Creeks. There are small flats along these creeks which are suitable for irrigation, and during dry years require irrigation to grow a crop. The water-supply in this district, however, is very limited. When the snow is melting, or during periods of heavy and continuous rain, there are small floods, but in a dry year, as near as can be learned from the older settlers, the flow in these streams gradually diminishes and stops altogether early in the summer. We did not establish any regular stations or gauge-rods at any of these creeks, as at Pierce Creek the only available place to gauge it was some three miles from Mr. Pierce's house, and at Notukeu and Bull Creeks the land is homesteaded but there is no one with permanent residence, and, therefore, no gauge-rod readers were available.

From Bull Creek we proceeded to Huff's ranche on the Frenchman River and re-established the gauge on N.W. $\frac{1}{4}$ Sec. 5, Tp. 5, Rge. 14, W. 3rd Mer. From Huff's ranche we followed the north shore of the Frenchman River to Seventy Mile crossing in Sec. 32, Tp. 3, Rge. 13, W. 3rd Mer., where we crossed the river, and after following the south shore for a couple of miles pulled west out on the bench, and did not touch the river again until we crossed it in Sec. 4, Tp. 1, Rge. 10, W. 3rd Mer., near the International Boundary. Along the Frenchman River there are large flats, which are quite suitable for irrigation, but there is little opportunity of storing water. Most of the level land has been filed on by homesteaders.

Following the International Boundary towards the east, we crossed a very rolling prairie which is quite suitable for ranching and grazing purposes. There are a number of streams flowing south and southeast, which had water in pools. From what we could learn from the older settlers, these streams remain in this condition almost every summer but do not have any flow except during the spring freshets.

The streams were all of this nature until we reached Rocky Creek in Tp. 1, Rge. 6, west of the 3rd Meridian. This creek had a flow of over three second-feet, is fed by some very strong springs and drains several townships. It has a constant flow and would probably irrigate several hundred acres. Near the International Boundary this stream traverses a large flat of several hundred acres which could be irrigated. After following upstream for a few miles we found that Rocky Creek passed through "bad lands," which were impassable with a wagon. We therefore left the creek and turned northeastward and after crossing a very hilly district, quite suitable for ranching and grazing purposes, we crossed Rocky Creek in Sec. 18, Tp. 2, Rge. 4, W. 3rd Mer. In this locality the creek flows through a narrow valley, with little opportunity to irrigate. Rainy weather had made travelling very difficult, and, as our supply of oats and food was almost exhausted, we decided to go to Wood Mountain for supplies. On reaching there we found that there was no store and we could not get either groceries or oats. It was therefore decided to leave the boundary line and inspect Wood River.

One branch of Wood River rises near Wood Mountain post office. This had almost ceased flowing, but a rainstorm started a very small flow while we were there. There was a small flow into Twelvemile Lake, but no overflow. Following this branch of Wood River, which had a little water in pools, we reached the main stream on Sec. 6, Tp. 8, Rge. 5, W. 3rd Mer., near Capital post office, and inspected it at several points between Capital and Lake Johnston. There is only a very small flow in this stream, and, as it has a very small fall, there is scarcely any current at all. It was impossible to find a place where a meter could be used near Capital. We made a slope measurement, but, owing to the dense growth of grass in the channel, the results were very unsatisfactory. We made a gauging on Sec. 31, Tp. 10, Rge. 4, W. 3rd Mer. near Gravelbourg and found the discharge to be about 6.5 second-feet, but it was impossible to gauge the river near Lake Johnston.

Wood River has a very small fall and is more of the nature of a long slough than that of a running stream. The channel is from twenty to fifty feet wide, and is from two to five feet deep. The bottom is composed of soft clay and is covered with weeds and grass. There is so little fall that it would be impossible to take out water by gravity, and a dam would flood a large area of good agricultural land. The drainage basin includes a very good agricultural district, but there is little possibility of irrigation development. Notukeu Creek had a small flow near

its mouth, but Pinto and Wiwa Creeks were practically dry at their mouths. There was no flow at all from Lake Chaplin to Lake Johnston and there has not been for several years.

Mr. Sauder left the party at Courval post office on June 28th. Following Mr. Sauder's instructions, I proceeded north to Morse and then to Swift Current.

From Swift Current we proceeded south over the same route as that followed on the previous occasion as far as Seventy Mile crossing, in Tp. 3, Rge. 13, W. 3rd Mer. On this occasion we struck east from Seventy Mile for several miles and then south, coming to the Frenchman River in Sec. 34, Tp. 2, Rge. 12, W. 3rd Mer. We crossed the river here and followed the west shore to McArthur's ranche on Sec. 18, Tp. 2, Rge. 11, W. 3rd Mer. Here we left the river and struck southeast across the bench until we reached the boundary line and then east to the river. We passed several coulees running into the Frenchman river in Tp. 2, Rges. 11 and 12, but none had running water.

Leaving Frenchman River we proceeded east along the boundary line over the same route as on the previous occasion as far as Rocky Creek in Sec., Tp. 1, Rge. 6, W. 3rd Mer. From here we followed east, touching the west branch of Poplar River in Sec. 5, Tp. 1, Rge. 3, W. 3rd Mer., and the centre or main fork of Poplar River in Sec. 8, Tp. 1, Rge. 29, W. 2nd Mer. The west branch of Poplar River had a very small flow of about 0.08 second-feet. It resembles Wood River in many ways being from 30 to 75 feet wide and is from two to three feet deep. It is full of weeds and is very sluggish. The main fork of Poplar River is also sluggish in many places. The banks are very low for some distance on both sides of it, and are probably covered with water during the early spring. The discharge of this stream was 0.8 second-feet.

On account of running short of provisions we travelled north from Poplar River to Willowbunch, where, on account of my teamster giving notice of leaving, I decided to return to Swift Current.

From Willowbunch we followed the Pole trail to Wood Mountain and then took the old police or Hudson Bay trail to Seventy Mile crossing. From Willowbunch to Wood Mountain we did not pass any streams, though there is considerable moisture supplied by springs. On leaving Wood Mountain we travelled by a good trail over a rolling country which brought us across the head-waters of Wood River, which consist of about 12 creeks running north and northeast. Of these creeks only four had running water in them, and, as the country is rolling, there is little possibility of irrigation. Leaving the head-waters of Wood River we crossed the head-waters of several creeks running south into Frenchman River. These were following deep coulees but did not have any flow. Apparently the only time of the year that these creeks run is during the time that the snow is melting or during very heavy rains. From Seventy Mile crossing we travelled north to Notukeu Creek by way of Huff's ranche, following the same trails as we did travelling south. We then travelled along Notukeu Creek to N.E. $\frac{1}{4}$ Sec. 29, Tp. 9, Rge. 12, W. 3rd Mer., passing Pierce Creek on the way. Pierce Creek had a very small flow at its mouth, but I do not think that this flow would be added to if Mr. Pierce were to discontinue using the north fork of this creek for irrigation purposes. The flow above his head-gates is very small and would in all probability disappear before reaching Notukeu Creek. After leaving Sec. 29, Tp. 9, Rge. 12, W. 3rd Mer., we travelled north to the head-waters of Whisky (or Russell) Creek in Sec. 36, Tp. 11, Rge. 13, W. 3rd Mer. This had a discharge of 1.5 second-feet, but there is little possibility of irrigation. From this point we travelled northwest to Swift Current and did not pass any further streams on the way.

After obtaining another teamster I again left Swift Current and travelled south to Frenchman river at the boundary line, inspecting Pierce, Notukeu and Bull Creeks on the way, also Frenchman River at Huff's ranche. We followed the same route as on the previous occasion with the exception that when travelling from Seventy Mile crossing to the boundary line we followed the west shore of Frenchman River as far as Heinrich's ranche in Tp. 1, Rge. 11, W. 3rd Mer., before striking on to the bench. There are flats along the Frenchman River between McArthur's ranche and Heinrich's ranche which could probably be irrigated by storing waters in the coulees which run into Frenchman river.

From Frenchman River we followed the boundary line over the same route as on the former trip as far as Poplar River, inspecting Rocky Creek and others crossed on the previous occasions. Levels were run on Rocky Creek and the West Branch of Poplar River. The fall in Rocky Creek taken in Sec. 5, Tp. 1, Rge. 6, W. 3rd Mer., is 2.225 feet per mile; that in the West Branch of Poplar River in Sec. 5, Tp. 1, Rge. 3, W. 3rd Mer., is 0.5 feet per mile.

From Poplar River (Sec. 1, Tp. 1, Rge. 29, W. 2nd Mer.) we continued east over a very rough rolling prairie, crossing the East Fork of Poplar River in Sec. 4, Tp. 1, Rge. 26, W. 2nd Mer. This river has a large flat on it in Tp. 1, Rge. 26, W. 2nd Mer., which could be irrigated. The discharge of the river on August 23rd was 4.98 second-feet. The country between ranges 25 and 23 was so rough that we had to travel some distance south of the boundary line. No streams were passed until we reached Beaver Creek in Sec. 5, Tp. 1, Rge. 23, W. 2nd Mer., which had a flow of 0.539 second-feet. The country around Beaver Creek is very rolling and unsuitable for irrigation. We continued east until we reached Sec. 4, Tp. 1, Rge. 22, W. 2nd Mer., and, striking a good trail here leading to Plentywood, Montana, and being about out of oats and provisions, we decided to go there to replenish our supply.

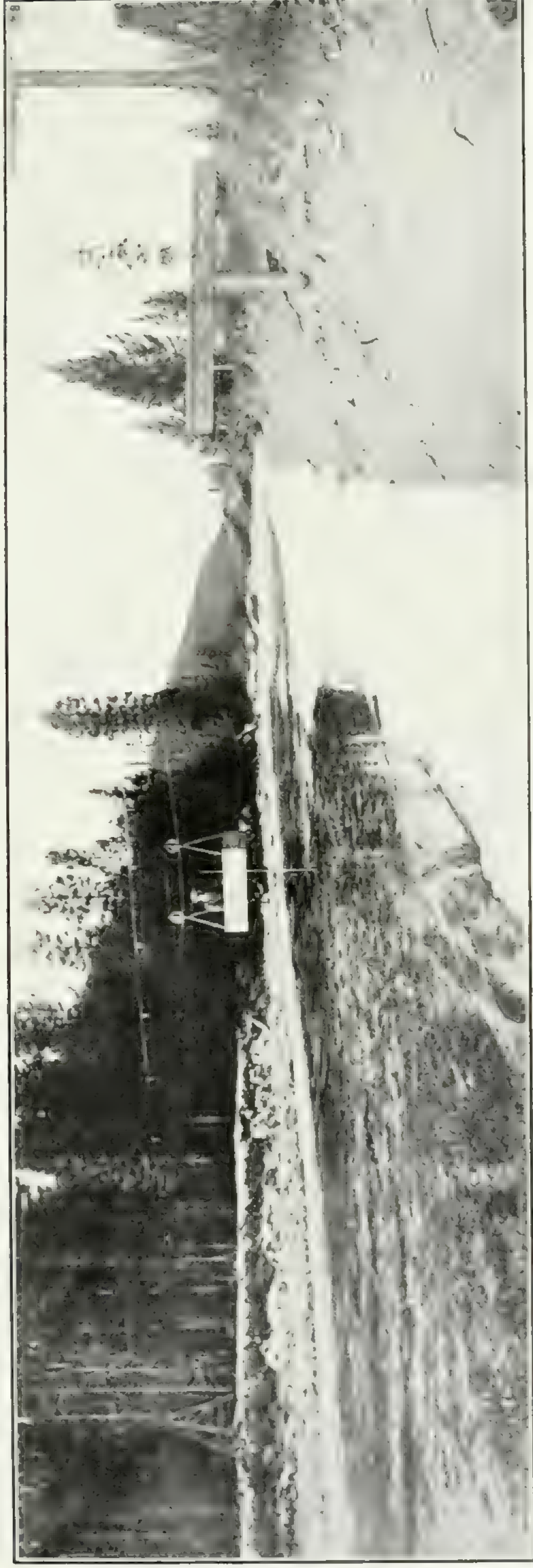
From Plentywood we travelled due north to the boundary line at Sec. 1, Tp. 1, Rge. 21, W. 2nd Mer., and from here to Bigmuddy police detachment, in Sec. 10, Tp. 1, Rge. 22, W. 2nd Mer.



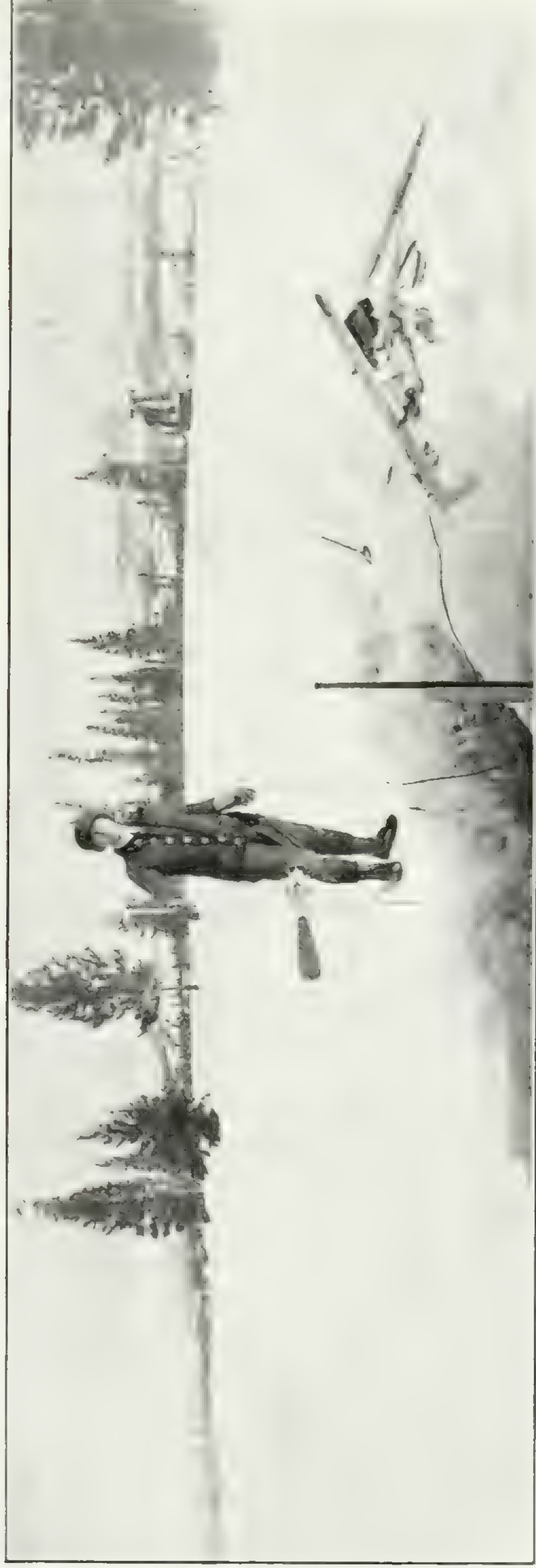
Wood Mountain Party Cooking Breakfast. Taken by P. M. Sauder.



Wood Mountain Party Breaking Camp. Taken by P. M. Sauder.



Gauging Station on Bow River at Laggan in early Fall. Taken by V. A. Newhall.



Gauging Station on Bow River at Laggan in Winter. Taken by V. A. Newhall



Gauging Station on Pipestone River near Laggan in early Fall. Taken by V. A. Newhall.



Gauging Station on Pipestone River near Laggan in Winter. Taken by V. A. Newhall.

SESSIONAL PAPER No. 25d

There is a large flat here of heavy soil which leads from Bigmuddy Lake. We followed this flat until we came to the lake and found that there is a very great deal of alkali both at the lake and all along the valley. Leaving Bigmuddy Lake we travelled west crossing the head-waters of Beaver Creek in Tp. 2, Rge. 24, W. 2nd Mer. The country was very rolling and the creeks were either dry or had water standing in pools; none were flowing. On striking the trail to Willowbunch we followed it until we reached the town.

From Willowbunch we travelled southwest to Fife Lake and then to J. M. Knox's ranche in Sec. 28, Tp. 3, Rge. 3, W. 2nd Mer. We passed Hay Meadow Creek which has a very large flat along it, and had a discharge of 13.26 second-feet. This, however, was taken after a very heavy rain, and the normal discharge of the creek is very probably somewhat less. At J. M. Knox's place there is a large flat which covers the greater part of the N.W. and S.W. quarters of Sec. 28, Tp. 3, Rge. 30, W. 2nd Mer. In a coulee in Sec. 29, Tp. 3, Rge. 30, W. 2nd Mer., there is a large spring which could be used to irrigate the land owned by Mr. Knox. Owing to the porous nature of the soil, which is of a heavy sandy loam, the water from this spring disappears in the N.W. $\frac{1}{4}$ Sec. 28, Tp. 3, Rge. 30, W. 2nd Mer. Although the country is very hilly for some miles west and south of this point, and is probably more suitable for ranching purposes than for agricultural, there are numerous springs throughout the district which lead into small flats which could with small expense be irrigated. Many of the settlers in this district are from the western states and have used irrigation previous to the time of their coming to Canada to live. We made a short trip to a small creek in Sec. 2, Tp. 4, Rge. 1, W. 3rd Mer., which had a discharge of 0.994 second-feet; there are small flats of about ten acres each which could be irrigated. From J. M. Knox's place we travelled to Mr. Franks' place in Sec. 17, Tp. 4, Rge. 1, W. 3rd Mer. There is a fine large spring in the S.W. $\frac{1}{4}$ Sec. 17, Tp. 4, Rge. 1, W. 3rd Mer., which forms the head-waters of Hay Meadow Creek. The fall for several hundred feet from the spring is one foot in one hundred feet. Mr. Franks could use this spring to irrigate about ten acres in the quarter-section south of him. From this point we travelled to Wood Mountain and then followed the same route, as we did while Mr. Sauder was with us, as far as Lynthorp in Sec. 1, Tp. 7, Rge. 4, W. 3rd Mer., taking gaugings of Wood Creek in Sec. 20, Tp. 4, Rge. 3, W. 3rd Mer., and near its mouth at Twelve Mile Lake in Sec. 4, Tp. 6, Rge. 3, W. 3rd Mer. At the latter point the discharge was 4.36 second-feet. This rather large flow was caused by recent heavy rains.

From Lynthorp we travelled northwest to Gravelbourg, crossing Wood River in N.W. $\frac{1}{4}$ Sec. 18, Tp. 10, Rge. 4, W. 3rd Mer. There is a very good cross-section at this point, and it is the only good place to take gaugings which we met with along Wood River. The discharge here was 5.21 second-feet. Levels were run along Wood River in Sec. 31, Tp. 10, Rge. 4, W. 3rd Mer., which gave a fall of but 0.5 feet per mile. While at Gravelbourg we made a trip north, crossing Notukeu and Wiwa Creeks, and touched Wood River in Sec. 4, Tp. 13, Rge. 4, W. 3rd Mer. On account of the river being very low, the result obtained at the latter point was poor.

On leaving Gravelbourg we travelled west along the township line between Townships 10 and 11 as far as Notukeu creek in Sec. 5, Tp. 11, Rge. 10, W. 3rd Mer. The discharge here was 11.76 second-feet. Striking north, we crossed Russell Creek near its mouth at Sec. 17, Tp. 11, Rge. 10, W. 3rd Mer. (discharge 1.183 second-feet), and Mosquito Creek in Sec. 20, Tp. 11, Rge. 10, W. 3rd Mer. From this latter creek we travelled northwest to Swift Current. On September 18th, I took the transport and camp equipment to Maple Creek, disposing of it there as per instructions.

With regard to further work in the Wood Mountain district, there is little possibility of irrigation developments outside of the Frenchman River, Rocky Creek, and some very small schemes in the townships on the west side of Fife Lake, and I do not consider that further data in this district are of sufficient importance to warrant the expense of keeping an outfit in this district another year.

APPENDIX No. 2.

REPORT ON THE WINTER CONDITIONS IN THE BANFF DISTRICT DURING THE WINTER OF 1911-12, BY V. A. NEWHALL, B.A.Sc., DISTRICT HYDROGRAPHER.

In this district winter work was begun shortly after the severe cold spell in the early part of November. Prior to this, great trouble was experienced with floating slush, and anchor ice. In all the mountain streams anchor ice forms on the stones and boulders in the river-bottom before surface ice forms. The swiftly flowing water probably breaks any ice crystals forming on the surface, where the air is in contact with the water, while in the river-bottom crystals can adhere to the rough surfaces of the boulders and rock fragments. On many streams this floating mass was in such quantities that not only was the meter stopped but was even in danger of having stay-line and cable broken and carried away.

The severe cold weather created a surface ice at the stations having low velocities. This was the case on the Bow River at Morley.

Bow River at Morley had ice formed on it, then slush ice packed underneath, so that the meter could not revolve. This condition continued until the station was abandoned at the close of 1911.

Bow and Pipestone Rivers, at Laggan, were blocked by an ice-jam, so that the stations had to be temporarily abandoned. The cross-sections at these stations were later cut open in trenches three feet wide and down to the water, which was four to five feet below the top of ice. The difficulty experienced with such conditions as these is that the lowest ice surface—that in contact with the water—is composed of ice fragments, which deflect the water and disturb the stream-lines, so causing velocities that are the result of eddies and currents.

Bath Creek, at Laggan, flowed open during the entire winter season.

Bow River, at Banff, was ice-covered at the gauging section only once during the winter. At other times shore ice extended fifteen feet from each side, but this was cleared away to give open-water conditions.

On the Spray, Ghost and Kananaskis Rivers, ice formed at the sides, but owing to their high velocities these streams were kept open in the centre, until later in the season.

Devils Creek and Cascade River were both influenced by the construction of the dam controlled by the Calgary Power Company. The gauging station on Devils Creek had the ice cleared away by the huge flow that was continued for a day and a half, while the overflowing of the ice at the Cascade station, together with the ice cakes that jammed there, made it impossible to get a reliable gauging. If such an amount of water is released during a "hard" winter, when the snow is deep and the quantity of ice great, the Cascade station will be rendered useless again.

The foregoing give the conditions as they were in general, though at every visit some variation might be noted.

Gauge-height records under such conditions are practically valueless, as the water may be backed by a jam or raised by a thicker ice-formation. This latter should be explained by stating that in all swiftly flowing streams the ice forms in an arch, the greatest thickness being at the shores; hence ice formation crowds the water higher in the centre. Ice so formed influences gauge-heights when a thaw comes, the water melting the ice at the sides, thus making a greater flow, though an apparent drop or very small increase may be observed on the gauge. To obtain gauge-height records of winter flow where the section is poor would mean clearing away, by sawing or cutting, the rough ice that formed, for a width of about twenty-five feet across the entire section, to permit a new and better formation, but this is too expensive for records, which even then would not always be reliable.

A great trouble experienced in gauging when the temperature is more than twelve degrees below zero is the formation of ice on the meter, hindering the ready revolution of the cups and necessitating repeated warming. If the surface ice is covered with snow this seems to serve as a protective covering and reduces the escape of the heat in the water, by conduction, through the ice to the air. Much trouble lies in the bending of the electric cable when ice-coated. A break should usually be sought in this section before wasting time seeking elsewhere.

With regard to cutting tools three are necessary, namely ice-axe, ice-chisel and shovel, while a fourth, an ice-needle, is useful when breaking ice underneath water.

APPENDIX No. 3.

DESCRIPTION OF AN APPARATUS FOR ADJUSTING THE LENGTH OF THE CREST OF A STEEL RECTANGULAR WEIR TO ANY DESIRED LENGTH, USED IN THE EASTERN CYPRESS HILLS DISTRICT, BY G. H. WHYTE, DISTRICT HYDROGRAPHER.

In the hydrographic work in the Maple Creek district, it has been found that the equipment must be reduced to a minimum, in so far as the accuracy of the results will permit. For this reason it was found that the carrying of two weirs would cause considerable inconvenience. At the same time there were a number of springs which it was necessary to measure. These small streams could not be measured with a 24-inch weir to a sufficient degree of accuracy. To overcome this difficulty, the attachment shown in Plates 46 and 47 was constructed and used with the 24-inch weir, to reduce the weir-crest to any desired length.

A plate of steel (see Plate 46) of the same thickness as the weir-face, was obtained and the bottom cut at the same angle as that of the weir plate (45°), resulting in a close joint. The left side was also bevelled to 45° so as to form a sharp edge upstream. This plate was attached to the weir by means of angles making it possible to adjust their lengths slightly.

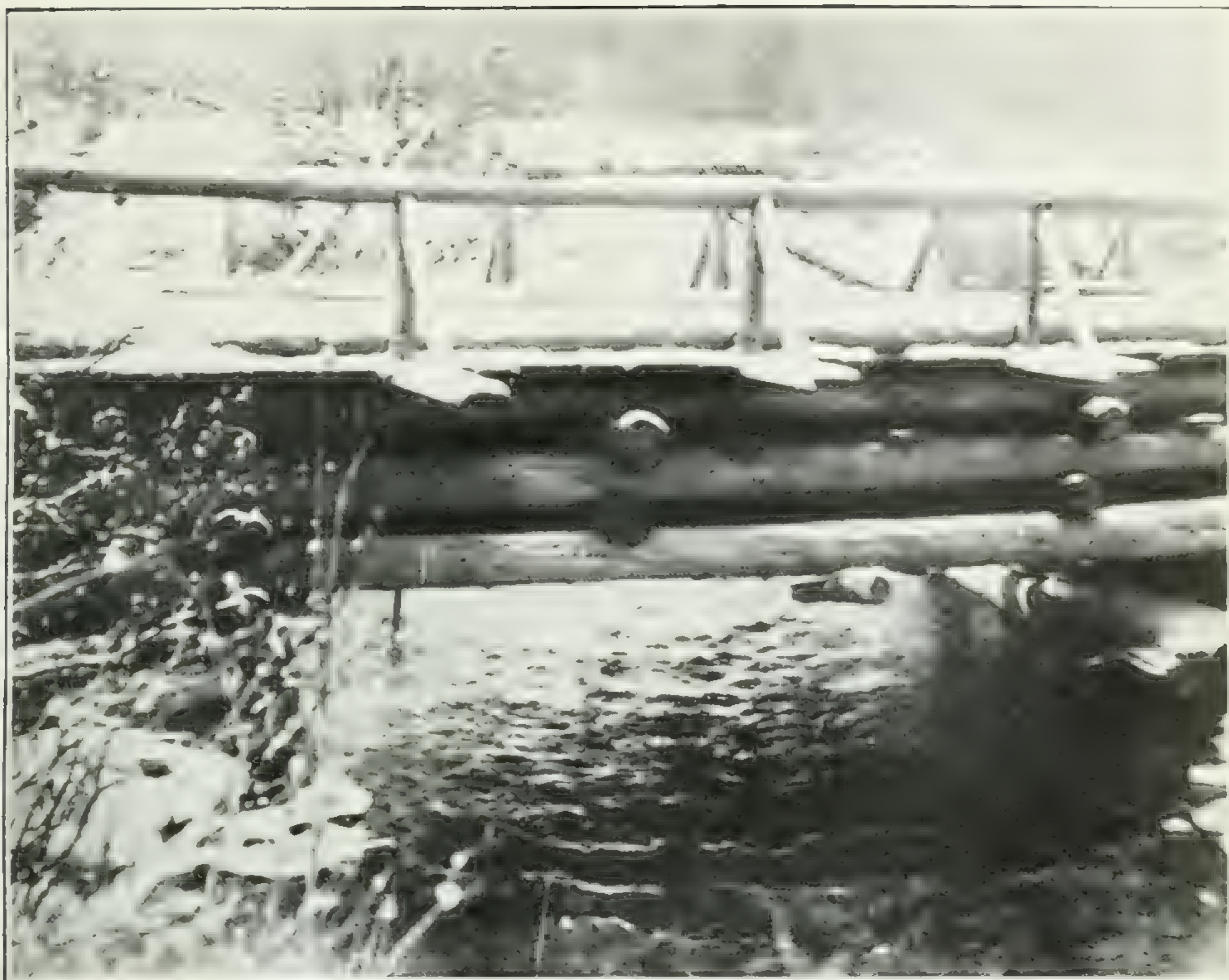
To use this attachment, the weir is set in the creek as for ordinary use, then the plate is put on and clamped at the desired point. The crest is graduated to feet and inches, making it possible to obtain at once the desired width of crest. The intervening space between the plate and the edge of the weir is filled with sod, allowing the water to pass through the other opening only (see Plates 48 and 49).



Mass of Ice on Cascade River at C. P. R. Bridge, caused by turning water into the river from the reservoir during a very cold spell of weather.
Taken Feb. 27, 1912, by V. A. Newhall.



Mass of Ice on Cascade River at Traffic Bridge near Anthracite, caused by turning water into the river from the reservoir during a very cold spell of weather. Taken Feb. 27, 1912, by V. A. Newhall.



Gauging Station on Devil's Creek near Barkhead, Alta.



Gauging Cascade River on Feb 27th, 1912.

PLATE No. 44.



Gauging Cascade River near Bankhead in Winter.

PLATE No. 45.



Gauging Kananaskis River near Kananaskis in Winter.

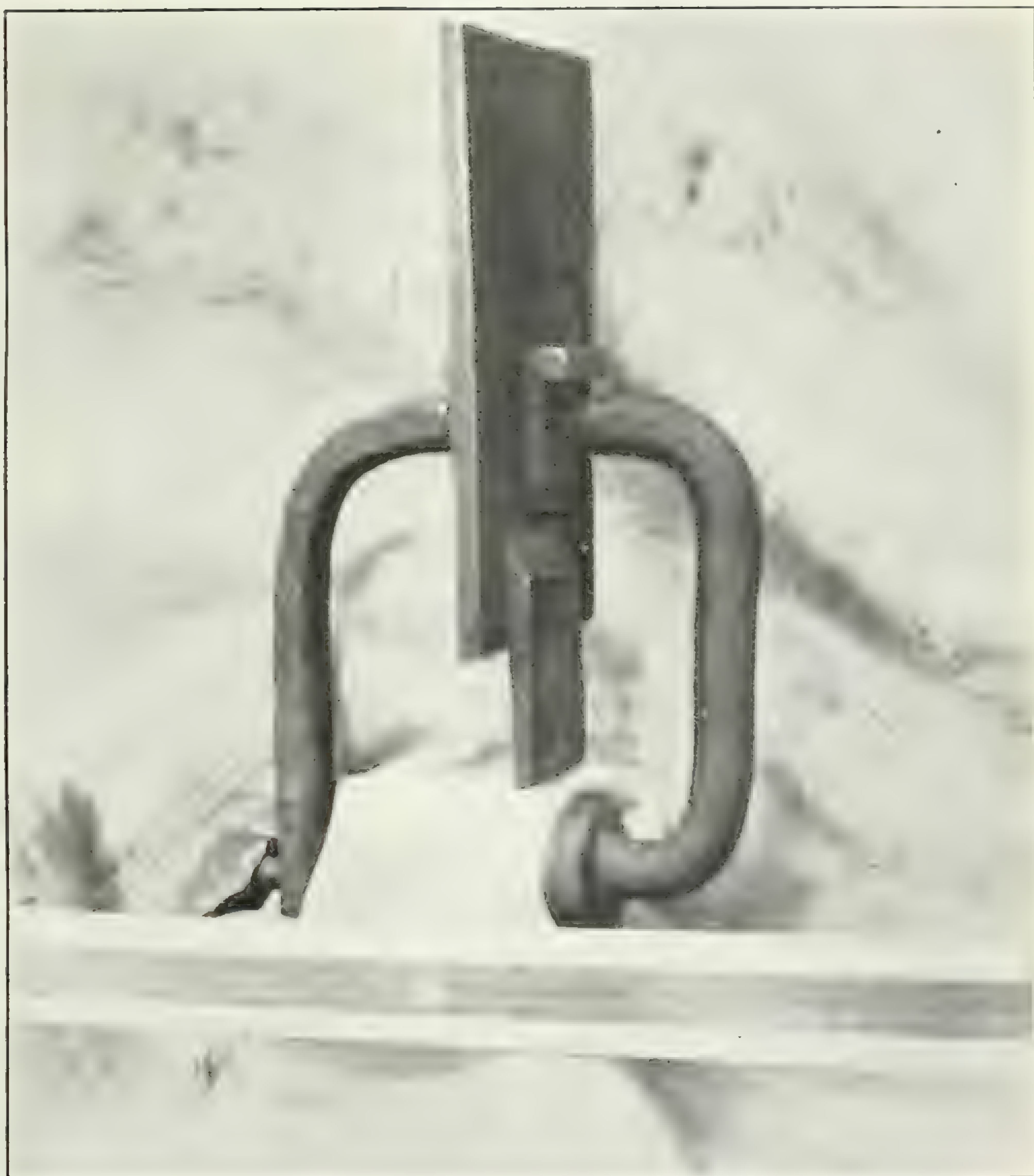


Plate and Angles for adjusting the Length of the Crest of a Steel Rectangular Weir.
Taken by G. H. Whyte.

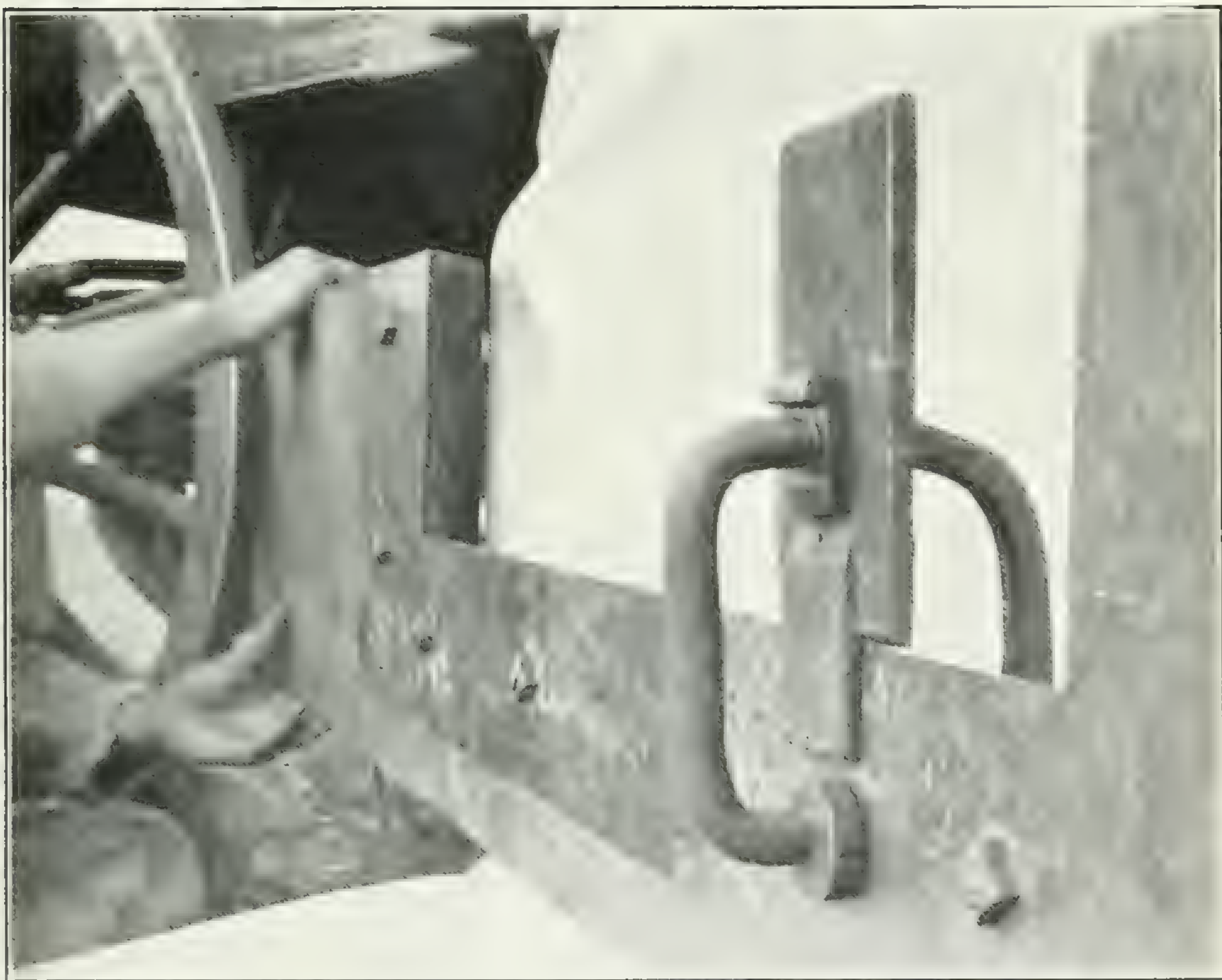


Plate attached to a 24-inch Weir. Taken by G. H. Whyte.



24-inch Weir reduced to 9-inch Crest in Use; Downstream Side. Taken by G. H. Whyte.



6 inch Wide embedded to 6 inch Crest in Igneous Diatom Side. Taken by G. H. Whyte.

APPENDIX No. 4.

REPORT ON THE CURRENT-METER RATING STATION ESTABLISHED BY THE IRRIGATION OFFICE, DEPARTMENT OF THE INTERIOR, AT CALGARY, ALBERTA, BY F. H. PETERS, C.E., COMMISSIONER OF IRRIGATION.

A description of this rating station was, by permission, submitted by the Commissioner of Irrigation in the form of a paper to the Canadian Society of Civil Engineers. The following report is practically a reproduction of that paper.

The work of stream measurements has been carried on by the Irrigation Office, Department of the Interior, for a long period of years in the two provinces of Alberta and Saskatchewan, but it was not until the early part of 1909 that the great importance of this work was recognized by the Department, and at that time a special hydrographic surveys branch was organized under Mr. P. M. Sauder, C.E., from which time the work of stream measurements has been carried on systematically and extensively.

Prior to this time a current-meter rating station had been established on a slack-water mill-pond on Bow river at Calgary, but its equipment was never very satisfactory, and it finally fell into bad repair and its use was discontinued. Along with the formation of the hydrographic surveys branch was considered the matter of establishing an up-to-date and efficient current-meter rating station, because it was realized that without this equipment, by which means all current-meters used could be frequently rated, that the current-meter records would be liable to serious errors.

No active steps were, however, taken in the matter until the winter of 1910, when the plans, specifications and estimate of cost for the station and equipment were prepared by the writer. The contract for the work was let to the firm of Jones, Blackshire and Lyttle of Calgary, on May 29th, 1911, and was completed by them on July 21st, 1911. In carrying out the construction the steel reinforcing, the steel rails, the cement and the car were supplied by the Department, and the City of Calgary laid the water-supply pipe to the edge of the rating-station property. Everything else was included in the contract except some small electrical fittings which were installed after the work was completed under the writer's supervision. The total cost for the station and equipment was \$4475.39. The total estimated cost for the station was \$4690.24.

In designing the work the aim was to obtain the most perfect apparatus possible for rating the current-meters and to create a permanent structure, so that it was early decided to use concrete in the construction of the necessary tank.

As no stretch of still water having a suitable length and depth was available, it was necessary to create a tank, and in studying its design two points had to be principally considered. First, as the water-supply had to be taken from the city mains, the tank had to be made proof against any leakage, as the city authorities were not willing to guarantee any large supply of water such as might be required if any serious leakage from cracks developed in the tank. Second, the cross-sectional water area was required as small as possible and yet of sufficient dimensions to guard against any following-on movement of the water, in running the meters through the tank. To overcome the first difficulty a heavily reinforced structure was designed, such that, being emptied and exposed to the weather in winter no temperature cracks could develop and the inside faces of the tank were waterproofed by Sylvesters' process. In deciding on the proper cross-section of the tank to overcome the second difficulty no data were obtainable, but with the tank as constructed no following-on movement or undue disturbance of the water has been observed, even with the largest meters tested at velocities as high as 10 feet per second. The length of the tank (250 feet) was adopted in order to bring the cost of the structure within the limits of the amount of money available, but provision has been made in locating the tank for its future extension to a length of 500 feet, which is desirable in order to attain the highest degree of accuracy.

A description of the station will be given, the various points of which will be made clear by referring to the several plates.

The main features of the station are a car, on which the current-meter is mounted, and it is then run through the water in the tank at different uniform rates of speed. The three elements,—the distance, the time, and the number of revolutions of the meter—are mechanically measured, and from these the velocity of travel of the current-meter through the water is related to the revolution per second of the meter, which relation of revolutions to velocity constitutes the rating of the meter.

The concrete tank is 250 feet long with an inside width and depth of 6 feet by 5 feet 6 inches, and the depth of water to be maintained is 5 feet. The floor and walls are 8 inches thick and are reinforced heavily longitudinally and transversely with half inch round mild steel rods—in order to absolutely preclude any temperature cracks in the concrete. The concrete was specified a mixture of one part Portland cement to seven parts clean river gravel, to have at least fifteen turns in a good machine, and to be placed wet and thoroughly tamped. All the interior faces were thoroughly spaded in order to create a smooth close-grained surface to which to apply the

Sylvesters' wash. All steel rods at joints were overlapped sixteen inches and it was specified that they were to be wired so as to have contact throughout the whole of this length. The tank floor was laid on an 8-inch foundation of large stones overlaid with smaller stones and gravel, in order to provide thorough drainage for any water which might leak through the tank, so that when the tank is emptied in winter, and exposed to the weather no heaving might result from any water being lodged under the tank bottom. The soil beneath is of sandy character, which is permeable to water. The water-supply is from a two-inch iron pipe laid from the city mains and a six-inch tile drain 224 feet long, fitted with an iron gate-valve at the tank, allows the tank to be emptied at any time into the Bow river. After the tank was completed, all the inside faces were treated with two coats of Sylvesters' wash. At the time of writing, the tank has been exposed, empty, to two cold snaps with the thermometer at -30° and no cracking of the concrete whatsoever has resulted, except a few hair-line cracks near the top of the walls. As regards the waterproofing, two observation shafts were left along the tank sides running down to the foundation and no leakage whatever was observed, during the summer when the tank was full, except a slight dampness at the bottom of the side walls. It should be noted that another reason why it was desired to make the tank leak-proof, is because it is intended to obtain evaporation records at the tank in future seasons.

The track laid along the side of the tank for the car is of 16-pound, and laid to a gauge of 32 3/8 inches on 4 x 6 inch ties, fish plates and bolts being used to every joint. In laying the track the greatest care was exercised to get it laid solid and as level as possible, with close rail joints, in order that the car would run on the track as smoothly as possible. The measured run of the car is 200 feet, 25 feet being left at each end of the track in which to speed up the car, and the track at one end runs into the car-house, where the car is kept under lock and key, when not in use.

The original idea was that the car should be mechanically driven by an electric motor working on one of the axles of the car. It is an essential that the rate of travel of the car over its measured course should be uniform, but after much consideration the writer was not able to devise any method of control by which the rate of travel of the car could be kept uniform (without acceleration) throughout its run, if driven by an electric motor or some other mechanical means. The car is, therefore, propelled by hand, but its design is such that an electric motor can be easily attached at any future date if any means can be devised of overcoming the difficulty mentioned above.

The main features in the design of the car have been copied from the car used by the Bureau of Standards, United States Government at their current-meter rating station at Washington, D.C., blue prints of the design of which were very kindly lent by an officer of the Bureau of Standards.

The main features of the car are that the axles run in roller bearings and the platform is attached to the front axle by a pinion joint which makes the level of the platform entirely dependent on the rear axle, and thus any tendency of the platform to be twisted due to uneven tracks is overcome. It is thought that this arrangement eliminates practically all the sharp vertical movements which might otherwise be transmitted to the current meter in its travel through the water. Two horizontal iron arms project from the car to the centre of the concrete tank. When the meter is being rated with the rod suspension, the meter rods are clamped in these horizontal arms. When the meter is being rated with a cord suspension and weights, the vertical cord is run down through the sockets used for clamping the meter rods, and a removable iron arm is used for attaching a wire stay-line to the meter. The car wheels have solid flanges and all the iron in the car is of heavy section, the idea being that with a heavy car running in easy bearings it would be easier to maintain a uniform rate of travel than with a light car.

In making the run with the meter, the count of the revolutions of the meter and of the time interval are both automatically registered in the car-house by electric apparatus. The electric circuits from the car into the car-house are made by two trolley wires above the car and one wire laid along the ties between the tracks. The circuit from the meter for the count of the revolutions is made by the two trolley wires, while the circuit for the time interval is made by the ground wire with one auxiliary wire, and one of the trolley wires used for the return. The diagram submitted will show the layout of the electric circuits clearly. The distance over which each run is made is 200 feet, and this distance is marked by two rods set up vertically on the ties at the side of the car. On the car platform are two electric switches with long arms projecting over the edge of the car platform, and these, engaging with the two rods at 200 feet interval, close the electric circuit for this interval, running through the commutator box on the meter and thus the revolutions of the meter over the interval of 200 feet are transmitted to the car-house where they are registered by two electric registers set in series in order to check each other on the count. Some difficulty was experienced at first in getting the electric registers to count accurately when running the meters at high velocities, but this difficulty was overcome by always overhauling the commutator box on the meters and making a fine adjustment of the make--and--break apparatus therein. It will be seen that this method of counting the revolutions is liable to be slightly in error owing to the fact that the registers do not take any count of the fractional revolution of the meter at either end of the run. This error however, would be reduced to a minimum by increasing the length of the run.

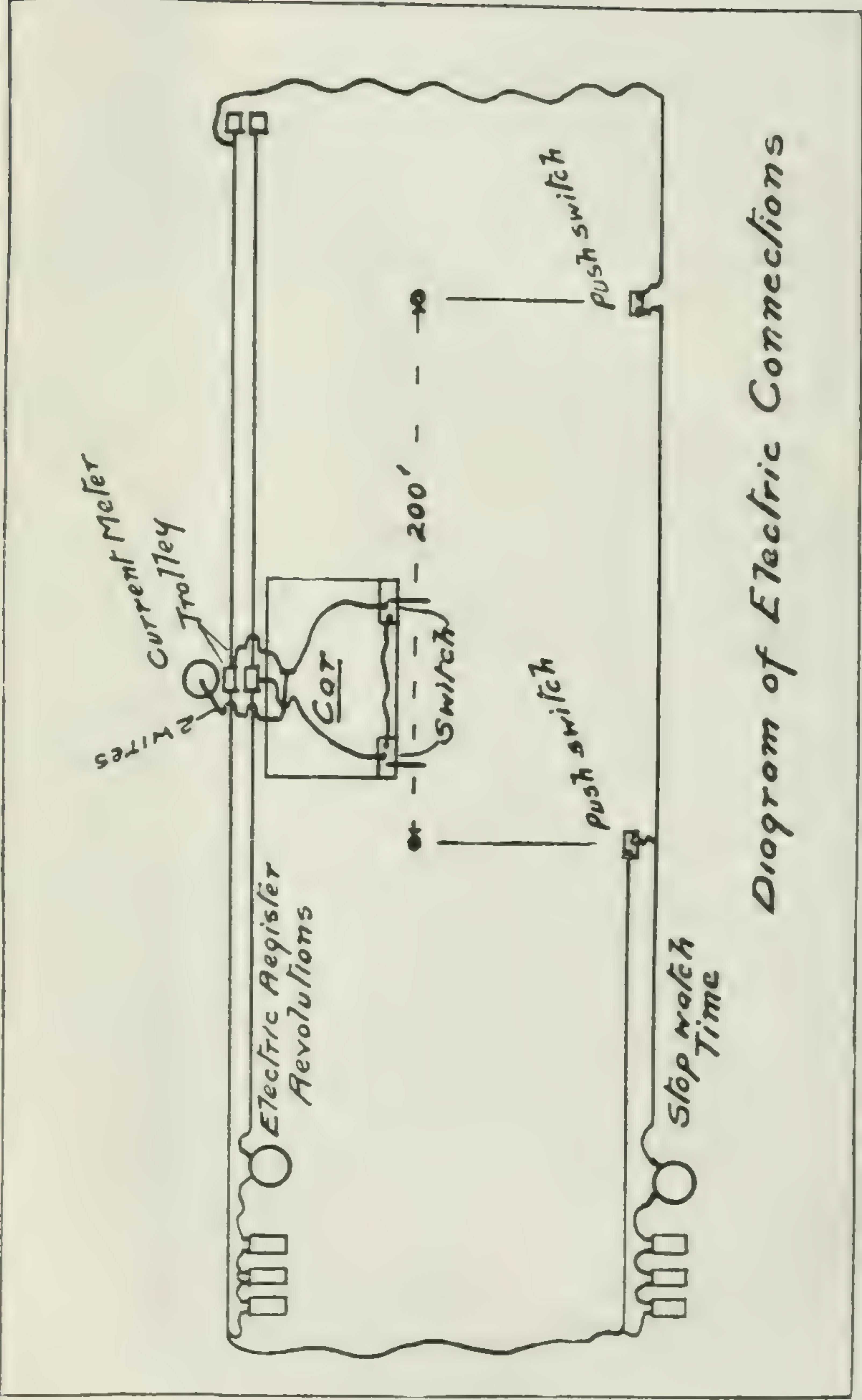
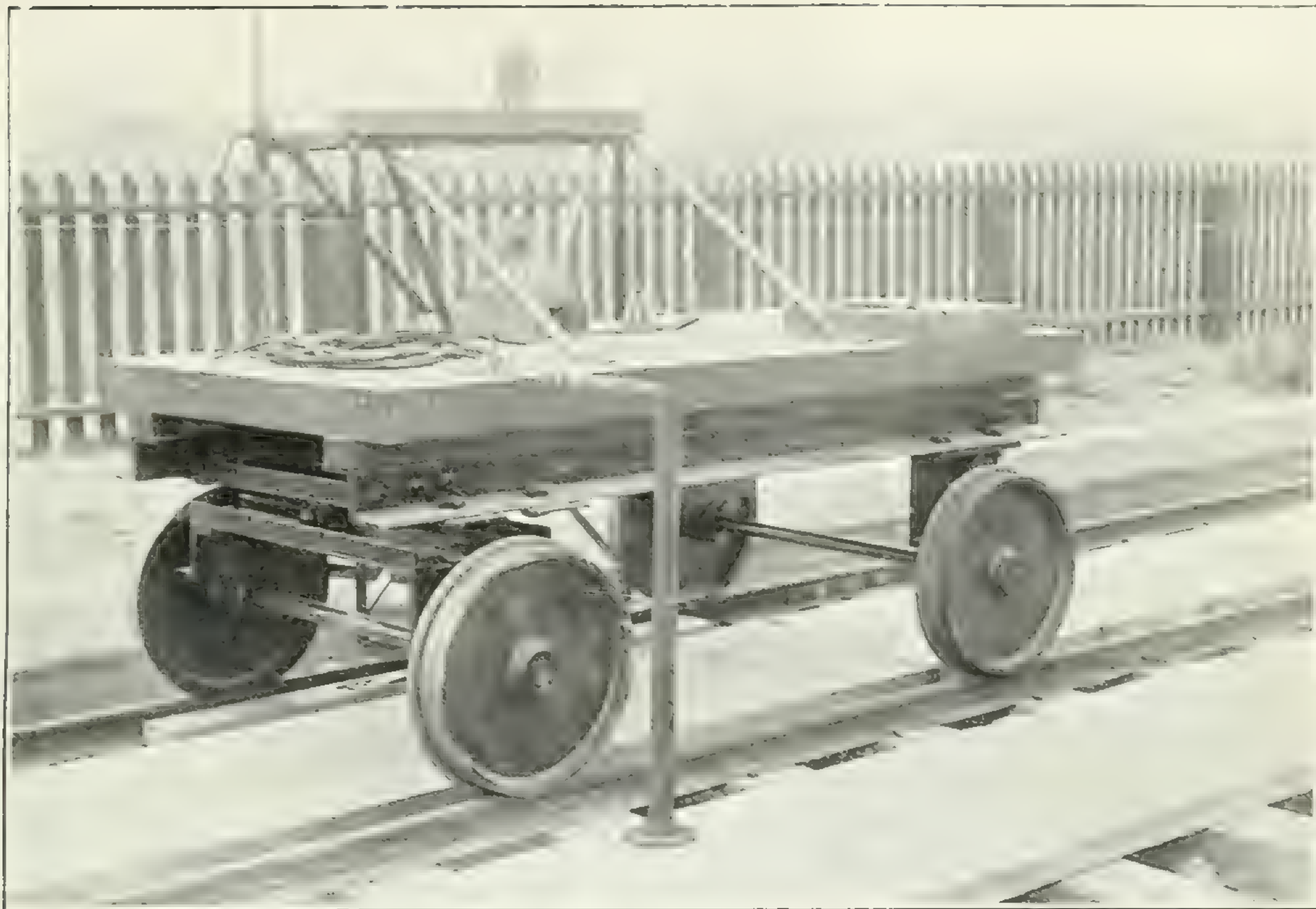


Diagram of Electric Connections



View of Current-meter Rating Car, showing Trolleys and Switches.



End View of Current-meter Rating Car, showing Car House behind



General View of the Current-meter Rating Car at rest.



The Current-meter Rating Car in motion.

SESSIONAL PAPER No. 25d

The time interval is counted by a stop-watch, which is operated by a simple electro-magnet, with a padded lever attachment, designed by the writer, in exactly the same manner that a stop-watch is operated by hand. At each rod, marking the 200 foot interval, the circuit running through the stop-watch via the ground wires has inset a one-nipple push-switch, and lugs underneath the car make and break the circuit as the car passes these two points, thus starting and stopping the watch at the respective ends of the 200-foot run and thereby counting the time taken by the car in making the run of 200 feet.

The procedure adopted in rating the meter is to make 20 runs for each meter with velocities varying from 0.5 feet per second to 10 feet per second, the increments in velocity for each run from the low speed to the high being as uniformly distributed between the limits as possible. From the data thus gained the revolutions per second with their corresponding velocities per second are computed, the points plotted and among them the most probable curve is drawn. From the rating curve thus constructed the rating table is prepared for use in the field and the office, showing in convenient tabular form the velocities corresponding to the various revolutions per second of the meter, from zero velocity up to 10 feet per second. It should here be noted that the rule in the service is not to measure any stream at a section where the average velocity falls below 0.5 feet per second, and a velocity of 10 feet per second is about the highest met with in practice.

Mathematically, the most probable curve is that drawn from values found from normal equations by the method of least squares. It is considered, however, that the method adopted of taking the values off a curve carefully plotted as noted above is quite accurate enough to meet all practical requirements, and the saving of time and labour by using this method is very great.

For purposes of keeping a graphical office record of the succeeding ratings of the meters a separate sheet is prepared for each meter. On this is first plotted, for purposes of comparison, the standard curve for the meter (Gurleys' standard curve for all Price electric meters) and all succeeding ratings of the meter will be plotted on the sheet in different-coloured inks, with notes as to the date of ratings, conditions of the meter, etc., until the confusion of many curves will require the preparation of a new curve sheet. Revolutions per second are plotted as ordinates to a scale of 4 inches to one revolution per second, and velocities in feet per second are plotted as abscissæ to a scale of 4 inches to 2 feet per second. For velocities up to 3 feet per second, an auxiliary curve is drawn with the velocity scale increased to 4 inches to 1 foot per second, to allow for greater precision in taking the quantities off the curve.

It is the intention to carry on extensive experimental work in order to determine the various conditions that affect the rating of the current-meter. Especially is it desirable to rate every large meter using the two methods of suspension, that is, by meter rods and by cable with stay line. With the limited time available during the past season it was possible to rate the meters only with the rod suspension. Some of the results obtained, however, are surprising and worthy of note. The writer has had a lengthy experience with the use of the Gurley No. 600, large Electric Meter, and his idea has always been (and he knows that it was shared by other men of experience) that with continued use on account of the pivot bearings constantly wearing, that the friction was increased, and that the revolution of the meter was thereby retarded. The experience of the past summer in rating nine of these meters has indicated that after considerable use the meters run fast instead of slow. The evidence points to the conclusion that with considerable use the bearing-points in the meter wear themselves smoother than they come new from the makers, and hence have less friction than when they are new. The experiments, however, have not been exhaustive enough to prove anything conclusively beyond the fact that, except when they are perfectly new, no current-meter can be relied upon unless it is carefully and frequently rated. The new medium-size type of electric meter (Gurleys' No. 623) had been adopted by this office for the first time this year, and therefore no experiments could be made on worn meters of this type. Five meters of this type were tested, of which two had been in light use for one season and three were perfectly new. All of these gave a rating curve practically the same as the standard curve issued by W. & L. E. Gurley, but in every case showing the meter running a little faster than Gurleys' standard.

Of the small electric meters (Gurleys' No. 618) nine were tested and all showed nearly the same results, although four of them had been in use for two seasons and five of them were new. At low velocities the new curve coincided with Gurleys' standard curve, but as the velocities increased the new curve dipped below the standard, which means that the meter was running slower than the standard. This may have been due to the bending, at high velocities, of the small meter-rods by which the meter was suspended from the car. This bending from the vertical of the meter rods was actually noticed to take place, but no opportunity was obtained to use a stay-line to keep the rods vertical, and thereby test the effect of the bending on the rating of the meter. As indicated above, it is the intention to carry on extensive experiments in the future to determine the effect of the method of suspension of the meter on the rating. In practice, all of the large streams are measured by suspending the meter in the stream with a cord and employing a stay-line to hold the meter up against the current. Under these conditions, especially with high velocities, there is a tendency for the meter to sway continually from side to side at right angles to the current, and it will be interesting and important to determine what effect this has on the revolutions of the meter. Identical conditions will not be obtainable at the rating station, as the length of the cord suspension will of necessity be much shorter than that

used either from a cable-car station or from a highway-bridge station, and this factor will no doubt, enter largely into the amount of sway that the meter will have. Four rating curves are submitted with this paper in order to show graphically, actual results obtained in rating meters of different types during the past summer. Explanatory notes have been added, (which do not appear on the original office copies) and the curves were selected to show typical cases.

Mr. V. A. Newhall had charge of all the meter ratings during the past season, and under his direction, the working parts of the station were finally tuned up, and the electric switches and recording apparatus were finally adjusted and improved to overcome difficulties met with in operation. To him, also, the writer is indebted for the notes on the behaviour of the several types of meters on being rated.

In conclusion, the writer would note, for the information of the engineering profession, that the Irrigation Office is prepared to rate any meters that may be sent in by any engineers or others, desirous of having their current-meters tested, and a certified rating table will be prepared and returned with the meters. A small fee will be charged to cover only the actual time of the engineer and his assistant, employed in making the rating and preparing the table, based on the salaries paid to the men of the Department.

INDEX

A.	
"Acre Foot," definition of.....	Page. 18
Alberta Railway & Irrigation Co.'s Canal, near Kimball, Alta. (2. 24. W4): description.....	125
Aldersyde Gauging Station: (See Highwood River).	
Anderson Ditch, near Thelma, Alta.: description.....	153
Antelope Lake Drainage Basin: general description.....	223
Antler Creek, North (3. 1. W2): discharge measurements, 1911.....	293
Axton East Ditch, near South Fork, Sask.: description.....	212
Axton West Ditch, near South Fork, Sask.: description.....	212
B.	
Banff District: summary of work.....	8
Winter, 1911-12 (V. A. Newhall).....	297
Banff Gauging Station: (See Spray River.)	
Bankhead Gauging Station: (See Devil's Creek. and Cascade River.)	
Bath Creek: discharge measurements, 1911.....	90
Battle Creek Drainage Basin: general description.....	165
Battle Creek at Nash's Ranche (3. 27. W3): description.....	179
discharge measurements, 1911.....	180
daily gauge height and discharge, 1911..	180
monthly discharge, 1911.....	181
Battle Creek at Tenmile Police Detachment (5. 29. W3): description.....	172
discharge measurements, 1911.....	173
daily gauge height and discharge, 1911..	173
monthly discharge, 1911.....	174
Battle Creek at Wilson's Ranche (6.28. W3): description.....	175
discharge measurements, 1911.....	176
daily gauge height and discharge, 1911 ..	176
monthly discharge, 1911.....	177
Battleford District: Summary of work.....	14
Battleford River at Battleford: description.....	28
discharge measurements, 1911.....	29
Bear Creek-East Branch (10. 23. W3): description.....	248
Bear Creek East Branch at Johnson's Ranche (10. 23. W3): description.....	236
discharge measurements, 1911.....	236
daily gauge height and discharge, 1911 ..	237
monthly discharge, 1911.....	238
Bear Creek West Branch (10. 23. W3): description.....	248
Bear Creek West Branch at Bertram's Ranche (10. 23. W3): description.....	238
discharge measurements, 1911.....	239
daily gauge height and discharge, 1911..	239
monthly discharge, 1911.....	240
Bear Creek, near Unsworth's Ranche, Sask. (11. 23. W3): description.....	241
discharge measurements, 1911.....	241
daily gauge height and discharge, 1911 ..	241
monthly discharge, 1911.....	242
Beargulch Creek (2. 9. W4): discharge measurements, 1911.....	148
Beaupre Creek (26. 5. W5): discharge measurements, 1911.....	90
Beaver Creek (1. 23. W2): discharge measurements, 1911.....	Page. 279
Beaver Creek Br. (1. 23. W2): discharge measurements, 1911.....	279
Belanger Creek at Garissere's Ranche (7. 25. W3): description.....	189
discharge measurements, 1911.....	190
daily gauge height and discharge, 1911 ..	190
monthly discharge, 1911.....	191
Belly River Drainage Basin: general description.....	120
Belly River, near Lethbridge, Alta. (19. 22. W4): discharge measurements, 1911.....	122
Belly River, near Mountain View (2. 23. W4): description.....	120
discharge measurements.....	121
Belly River, near Stand-Off, Alta (6. 25. 4.): description.....	121
Bench marks.....	16
Berry Creek at Forster's Ranche, Alta (23. 13. W4): description.....	33
discharge measurements, 1911.....	33
daily gauge height and discharge, 1911..	33
monthly discharge, 1911.....	34
Berry Creek, East Branch (22. 12. W4):.....	36
Bertram's Ranche Gauging Station (See Bear Creek).	
Beveridge East Ditch, on Piapot Creek, Sask. (10. 24. W3): discription.....	243
discharge measurements, 1911.....	243
Beveridge West Ditch, on Piapot Creek (10. 24. W3): description.....	243
discharge measurements, 1911.....	244
Bewley's Ranche Gauging Station: (See Fairfield Creek.)	
Bighill Creek (26. 4. W5): discharge measurements, 1911.....	90
Big Stick Lake Drainage Basin: general description.....	253
Bigmuddy Creek Drainage Basin: general description.....	279
Bigmuddy Flat (1. 22. W2): discharge measurements, 1911.....	279
Black Diamond Gauging Station. (See Sheep River S.Br.):	
Blacktail Coulee at Garissere's Ranche (6. 23. W3): description.....	193
discharge measurements, 1911.....	194
daily gauge height and discharge, 1911..	194
monthly discharge, 1911.....	195
Blairmore Creek (8. 4. W5): discharge measurements, 1911.....	118
Blindman River (39. 27. W4): discharge measurements, 1911.....	36
Blood Indian Creek at Hallam's Ranche, Alta. (23. 8. W4): description.....	34
discharge measurements, 1911.....	34
daily gauge height and discharge, 1911..	35
monthly discharge, 1911.....	35
Bone Creek at Lewis' Ranche, Sask. (8. 22. W3): description.....	215
discharge measurements, 1911.....	216
daily gauge height and discharge, 1911..	216
monthly discharge, 1911.....	217
Boundary Creek Gauging Station. (See Fidler Brothers' Ditch).	
Bow River Drainage Basin: general description.....	36
Bow River at Banff, Alta. (25. 12. W5): description.....	41
discharge measurements, 1911.....	41
daily gauge height and discharge, 1911..	42
monthly discharge, 1911.....	43

	Page		Page
Bow River near Bassano, Alta.		Cardston Gauging Station:	
description	87	(See Lee Creek.)	
discharge measurements, 1911	87	Carmichael's Spring (13. 29. W4):	
daily gauge height and discharge, 1911	88	discharge measurements	118
monthly discharge, 1911	89	Cascade River at Bankhead, Alta. (26. 11. W5):	
Bow River at Calgary, Alta. (24. 1. W5)		description	47
description	59	discharge measurements, 1911	47
discharge measurements, 1910-11	60	daily gauge height and discharge, 1911	48
daily gauge height and discharge, 1910	60	monthly discharge, 1911	48
daily gauge height and discharge, 1911	61	Cave (Banff):	
monthly discharge, 1910-11	62	discharge measurements, 1911	91
Bow River at Laggan, Alta. (28. 16. W5):		Chaplin River (14. 3. W3):	277
description	36	Cheeseman Ditch near Coulee (8. 29. W3):	
discharge measurements, 1911	37	description	165
daily gauge height and discharge, 1911	38	Christianson Ditch near Cardwell, Alta.	
monthly discharge, 1911	39	(3. 8. W4):	
Bow River, near Morley, Alta. (25. 7. W5)		description	121
description	53	Concrete Coulee (7. 23. W3):	
discharge measurements, 1911	54	discharge measurements, 1911	208
daily gauge height and discharge, 1911	54	Conditions of channel, changing	25
monthly discharge, 1911	55	Connelly Creek near Lundbreck, Alta.	
Bow River Creek near Walsh, Alta. (12. 30. W5)		(7. 2. W5):	
description	267	description	112
discharge measurements, 1911	267	discharge measurements, 1911	113
daily gauge height and discharge, 1911	267	Cool Creek (1. 1. W3):	
monthly discharge, 1911	268	discharge measurements, 1911	279
Brant Ditch near Lipton, Sask.		Coulee, A. 1. 21. W2):	
description	243	discharge measurements, 1911	279
Breed Creek (4. 12. 3.):		Coulee, A. (1. 25. W2):	
discharge measurements, 1911	208	discharge measurements, 1911	279
Bridge Creek Doyle's Rancho, Sask.		Coulee, A. (1. 28. W2):	
(10. 22. W3):		discharge measurements, 1911	279
description	223	Coulee, A. (1. 3. W3):	
discharge measurements, 1911	224	discharge measurements, 1911	279
daily gauge height and discharge, 1911	224	Coulee, A. (1. 3. W3):	
monthly discharge, 1911	225	discharge measurements, 1911	279
Bridge Creek at Gull Lake, Sask. (13. 19. W3):		Coulee, A. (1. 4. W3):	
description	228	discharge measurements, 1911	278
discharge measurements, 1911	229	Coulee, A. (1. 9. W3):	
daily gauge height and discharge, 1911	229	discharge measurements, 1911	278
monthly discharge, 1911	230	Coulee, A. (7. 21. W3):	
Bridge Creek near Skull Creek, Sask.		discharge measurements, 1911	223
(11. 23. W3):		Coulee, A. (7. 21. W3):	
description	226	discharge measurements, 1911	223
discharge measurements, 1911	226	Coulee Gauging Station:	
daily gauge height and discharge, 1911	227	(See Cheeseman Ditch).	
Monthly discharge, 1911	228	Cow Creek at Ross' Rancho (8. 2. W5):	
Bull Creek (8. 14. W5)		description	111
discharge measurements, 1911	277	discharge measurements, 1911	112
Bullpound Creek (25. 14. W4):		mean daily gauge height in feet, 1911	112
discharge measurements, 1911	36	Crane Lake Drainage Basin:	
Bullshead Creek at Clark's Rancho, Alta.		general description	236
(9. 5. W4):		Creek, A. (1. 23. W2):	
description	273	discharge measurements, 1911	279
discharge measurements, 1911	274	Creek, A. (2. 29. W2):	
daily gauge height and discharge, 1911	274	discharge measurements, 1911	279
Bullshead Creek near Dunmore, Alta.		Creek, A. (14. 29. W2):	
(12. 5. W4):		discharge measurements, 1911	279
description	275	Creek, A. (3. 30. W2):	
discharge measurements	275	discharge measurements, 1911	279
Burton Ditch, Alta. (11. 1. W5):		Creek, A. (4. 1. W3):	
discharge measurements, 1911	96	discharge measurements, 1911	279
		Creek, A. (4. 3. W3):	
		discharge measurements, 1911	277
		Creek, A. (1. 3. W3):	
		discharge measurements, 1911	277
		Creek, A. (5. 5. W3):	
		discharge measurements, 1911	277
		Creek, A. (5. 5. W3):	
		discharge measurements, 1911	277
		Creek, A. (5. 5. W3):	
		discharge measurements, 1911	277
		Creek, A. (5. 5. W3):	
		discharge measurements, 1911	277
		Creek, A. (7. 5. W3):	
		discharge measurements, 1911	277
		Creek, A. (1. 6. W3):	
		discharge measurements, 1911	278
		Creek, A. (1. 6. W3):	
		discharge measurements, 1911	278
		Creek, A. (1. 6. W3):	
		discharge measurements, 1911	278
		Creek, A. (5. 6. W3):	
		discharge measurements, 1911	277
		Creek, A. (1. 7. W3):	
		discharge measurements, 1911	278
		Creek, A. (5. 7. W3):	
		discharge measurements, 1911	277
		Creek, A. (5. 7. W3):	
		discharge measurements, 1911	277

	Page.
F.	
Fairwell Creek at Bewlay's Rancho (6. 24. W3):	
description.....	195
discharge measurements, 1911.....	195
daily gauge height and discharge, 1911..	196
monthly discharge, 1911.....	197
Fauquier's Rancho Gauging Station	
(See Hay Creek):	
Fearon-Moorhead Bridge Creek Ditch near	
Skull Creek, Sask.	
description.....	226
Fearon & Moorhead Main Ditch near Skull	
Creek (10. 22. W3):	
description.....	233
discharge measurements, 1911.....	233
Fearon & Moorhead Skull Creek Ditch, near	
Skull Creek, Sask. (10. 22. W3):	
description.....	232
discharge measurements, 1911.....	233
Fidler Brothers' Ditch at Boundary Creek, Alta.	
(1. 26. W4):	
description.....	123
Findlay & McDougall Ditch near High River,	
Alta. (18. 29. W3):	
discharge measurements, 1911.....	80
Fish Creek near Priddis, Alta. (22. 3. W5):	
discharge measurements, 1911.....	70
daily gauge height and discharge, 1911..	70
monthly discharge, 1911.....	71
Fish Creek N. Branch (22. 3. W5):	
discharge measurements, 1911.....	90
Fish Creek S. Branch (22. 3. W5):	
discharge measurements, 1911.....	90
Fortier's Spring (7. 1. W5):	
discharge measurements, 1911.....	118
Fortier's Spring East (7. 1. W5):	
discharge measurements, 1911.....	118
Fortier's Spring West (7. 1. W5):	
discharge measurements, 1911.....	118
Fourmile Coulee (8. 29. W3):	
discharge measurements, 1911.....	182
Frank Gauging Station:	
(See Crowsnest River.)	
Frenchman River Drainage Basin:	
description.....	182
Frenchman River N. Branch at Cross' Rancho	
(7. 22. W3):	
description.....	200
discharge measurements, 1911.....	200
daily gauge height and discharge, 1911..	201
monthly discharge, 1911.....	202
Frenchman River (1. 10. W3):	
discharge measurements, 1911.....	208
Frenchman River at Enright & Strong's Rancho:	
description.....	204
discharge measurements, 1911.....	204
daily gauge height and discharge, 1911..	205
monthly discharge, 1911.....	206
Frenchman River at Huff's Rancho (5. 14. W3):	
description.....	207
discharge measurements, 1911.....	208
French River N. Branch (8. 22. W3):	
discharge measurements, 1911.....	208
Future Work.....	17

G.

Gaff's Ditch near Tenmile Police Detachment	
(5. 29. W3):	
description.....	175
discharge measurements, 1911.....	175
Gaff's Ditch (Marshall Ranch):	
discharge measurements, 1911.....	182
Gap Creek at Small's Rancho, Sask.	
(10. 27. W3):	
description.....	256
discharge measurements, 1911.....	257
daily gauge height and discharge, 1911..	257
monthly discharge, 1911.....	258
Gap Creek near Maple Creek, Sask. (11. 26. W3):	
description.....	261
discharge measurements, 1911.....	261
daily gauge height and discharge, 1911..	262
monthly discharge, 1911.....	262
Garissere's Rancho Gauging Station:	
(See Blacktail Coulee & Belanger Creek.)	

	Page.
Gauging Stations:	
description.....	23
Ghost River at Gillies' Rancho, Alta. (26. 6. W5):	
description.....	56
discharge measurements, 1911.....	56
daily gauge height and discharge, 1911..	57
monthly discharge, 1911.....	57
Gilchrist Bros. Ditch near Kelvindhurst	
(5. 29. W3):	
description.....	178
Gillies' Rancho Gauging Station:	
(See Ghost River.)	
Glennie Creek (10. 24. W3):	
discharge measurements, 1911.....	248
Gold Creek (7. 3. W5):	
discharge measurements, 1911.....	118
Graham Creek (4. 27. W1):	
discharge measurements, 1911.....	293
Grand Valley (26. 5. W5):	
discharge measurements, 1911.....	90
Grayburn Creek (8. 1. W4):	
discharge measurements, 1911.....	182
Grosventre Creek at Tothill's Farm, Alta.	
(27. 9. W4):	
description.....	270
discharge measurements, 1911.....	270
daily gauge height and discharge, 1911..	271

H.

Half-Breed Creek (2. 10. 4.):	
discharge measurements, 1911.....	148
Hammond's Rancho Gauging Station:	
(See Middle Creek.)	
Hart's Rancho Gauging Station:	
(See Lodge Creek and Muddypound Creek.)	
Hay Creek at Fauquier's Rancho, Sask.	
(10. 25. 3.):	
description.....	250
discharge measurements, 1911.....	251
daily gauge height and discharge, 1911..	251
monthly discharge, 1911.....	252
Hay Creek at Hay Creek School, Sask.	
(10. 25. W3):	
description.....	248
discharge measurements, 1911.....	248
daily gauge height and discharge, 1911..	249
monthly discharge, 1911.....	250
Hay Creek, Branch of (10. 25. W3):	
discharge measurements, 1911.....	253
Hay Lake Drainage Basin:	
general description.....	248
Hay Meadow Creek (4. 30. W2):	
discharge measurements, 1911.....	279
Hewitt's Rancho Gauging Station:	
(See Lonepine Creek.)	
High River Gauging Station:	
(See Little Bow Ditch.)	
Highwood River (18. 2. W5):	
discharge measurements, 1911.....	90
Highwood River near Aldersyde, Alta.	
(20. 28. W4):	
description.....	86
discharge measurements, 1911.....	86
daily gauge height and discharge in feet,	
1911.....	86
Highwood River at High River, Alta	
(19. 28. W4):	
discharge measurements, 1911.....	83
daily gauge height and discharge, 1911..	84
monthly discharge, 1911.....	85
Hooper & Huckvale's Rancho Gauging Station:	
(See Mannyberries Creek):	
Horse Creek:	
discharge measurements, 1911.....	90
Huff's Rancho Gauging Station:	
(See Frenchman River):	

I.

Innisfail Gauging Station:	
(See Red Deer River):	
Interpolation:	
Stout method.....	
Bolster method.....	25

SESSIONAL PAPER No. 25d

	Page.		Page.
Integration Method:		monthly discharge, 1911.....	155
determining mean velocity	22	Lodge Creek at Willow Creek Police Detach-	
Introduction.....	7	ment (1. 29. W3):	
Irvine Gauging Station:		description.....	162
(See Ross Creek.)		discharge measurements, 1911.....	163
		daily gauge height and discharge, 1911..	163
		monthly discharge, 1911.....	164
J.		Lonepine Creek at Hewitt's Rancho:	
		description.....	187
Jones Coulee at Read's Rancho, Sask.		discharge measurements, 1911.....	188
(8. 20. W3):		daily gauge height and discharge, 1911..	188
description.....	212	monthly discharge, 1911.....	189
discharge measurements, 1911.....	212	Long Creek near Estevan, Sask. (2. 8. W2):	
daily gauge height and discharge, 1911..	213	description.....	289
monthly discharge, 1911.....	213	discharge measurements, 1911.....	289
Jumping Pound Creek, near Jumping Pound,		mean daily gauge height in feet, 1911...	290
Alta. (24. 4. W5):		Lost River (1. 4. W4):	
description.....	57	discharge measurements, 1911.....	148
discharge measurements, 1911.....	58	Low Velocity Limitation.....	23
daily gauge height and discharge, 1911..	58	Lyon Creek (7. 4. W5):	
monthly discharge, 1911.....	59	discharge measurements.....	118
K.		M.	
Kananaskis River near Kananaskis (24. 8. W5):		Mackay Creek at Walsh, Alta. (11. 1. W4):	
description.....	51	description.....	264
discharge measurements, 1911.....	51	discharge measurements, 1911.....	265
daily gauge height and discharge, 1911..	52	daily gauge height and discharge, 1911..	265
monthly discharge, 1911.....	52	monthly discharge, 1911.....	266
Kaposvar Creek (19. 14. W2):		Mackay Creek, East Branch, at Grant's	
discharge measurements, 1911.....	282	Rancho, Alta. (10. 1. W4):	
Kelvinhurst Gauging Station:		description.....	263
(See Gilchrist Bros.' Ditch, Richardson's		discharge measurements, 1911.....	263
Ditch and McKinnon's Ditch).		mean daily gauge height in feet, 1911...	264
Kennedy Creek (1. 5. W4):		Mackay Creek, West Branch, at Schneider's	
discharge measurements, 1911.....	148	Rancho, Alta. (10. 2. W4):	
Ketchum Creek (4. 6. W4):		description.....	264
discharge measurements, 1911.....	151	Mackie's Rancho Gauging Station:	
Kidney Springs (Banff):		(See Milk River, South Branch).	
discharge measurements, 1911.....	91	Macleod District:	
Kimball Gauging Station, Alta.:		summary of work.....	9
(See St. Mary River.)		Mami Creek near Mountain View, Alta.	
Knight's Rancho Gauging Station:		(2. 27. W4):	
(See Milk River, N. Br.)		description.....	121
		Many Island Lake Drainage Basin:	
L.		general description.....	263
		Manyberries Creek, South Branch (5. 6. W4):	
Lake Johnston Drainage Basin:		discharge measurements, 1911.....	151
general description.....	276	Manyberries Creek at Hooper & Huckvale's	
Lake of the Narrows Drainage Basin:		Rancho (5. 6. W4):	
general description.....	230	description.....	149
Lee Creek at Cardston, Alta. (3. 25. 4.):		discharge measurements, 1911.....	149
	126	daily gauge height and discharge, 1911..	150
Lethbridge Gauging Station, Alta.:		monthly discharge, 1911.....	150
(See Belly River).		Maple Creek at Maple Creek, Sask. (11. 16. W3):	
Lewis' Rancho Gauging Station:		description.....	253
(See Bone Creek.)		discharge measurements, 1911.....	253
Lindner's Ditch near Battle Creek (6. 29. W3):		daily gauge height and discharge, 1911..	254
description.....	169	monthly discharge, 1911.....	255
discharge measurements, 1911.....	169	Maple Creek near Maple Creek, Sask.	
daily gauge height and discharge, 1911..	170	(11. 16. W3):	
monthly discharge, 1911.....	170	description.....	256
Lineham Spillway (19. 28. W4):		discharge measurements, 1911.....	256
discharge measurements, 1911.....	90	Marshall's Ditch near Tenmile Police Detach-	
Little Bow Ditch at High River, Alta.		ment (5. 29. W3):	
(19. 28. W4):		description.....	175
description.....	80	discharge measurements, 1911.....	175
discharge measurements, 1911.....	81	McDonald Creek (9. 8. W3):	
daily gauge height and discharge, 1911..	81	discharge measurements, 1911.....	277
monthly discharge, 1911.....	82	McEachran Creek (1. 7. W3):	
Little Bow River Drainage Basin:		discharge measurements, 1911.....	278
general description.....	91	McGillivray Creek (8. 4. W5):	
Lodge Creek (2. 29. W3):		discharge measurements, 1911.....	118
discharge measurements, 1911.....	165	McKay Creek (9. 1. W4):	
Lodge Creek Drainage Basin:		discharge measurements, 1911.....	269
general description.....	152	McKay Creek (13. 1. 4.):	
Lodge Creek E. Branch at English's Rancho		discharge measurements, 1911.....	269
(7. 3. W4):		McKay Creek, E. Br. (8. 1. W4)	
description.....	152	discharge measurements, 1911.....	269
discharge measurements, 1911.....	153	McKay Creek, West Branch (8. 2. W4):	
mean gauge height in feet, 1911.....	153	discharge measurements, 1911.....	269
Lodge Creek E. Branch (6. 3. W4):		McKinnon's ditch near Kelvinhurst	
discharge measurements, 1911.....	165	(4. 26. W3):	
Lodge Creek at Hart's Rancho (6. 3. W4):		description.....	178
description.....	154	discharge measurements, 1911.....	178
discharge measurements, 1911.....	154	McShane Creek at Small's Rancho, Sask.	
daily gauge height and discharge, 1911..	154	(10. 27. W3):	
		description.....	258
		discharge measurements, 1911.....	259

	Page		Page
daily gauge height and discharge, 1911..	259	Moosejaw Creek, near Lang, Sask.	
monthly discharge, 1911..	260	(11. 19. W2):	
Mean Velocity: Methods of Determination	22	description.....	283
Middle Spring:		discharge measurements.....	283
discharge measurements, 1911..	91	daily gauge height and discharge, 1911..	283
Middle Creek (4. 29. 3.):		monthly discharge, 1911.....	284
discharge measurements, 1911..	165	Moosejaw Creek at Bryce's Farm, Sask.	
Middle Creek (6. 2. 4.):		(15. 25. W2):	
discharge measurements, 1911..	165	description.....	284
Middle Creek, East Branch (6. 2. 4.):		discharge measurements, 1911..	284
discharge measurements, 1911.....	165	daily gauge height and discharge, 1911..	285
Middle Creek at Hammond's Rancho		monthly discharge, 1911.....	286
description.....	160	Moosejaw Creek at McCarthy's Farm, Sask.	
discharge measurements, 1911.....	161	(16. 26. W2):	
daily gauge height and discharge, 1911..	161	description.....	286
monthly discharge, 1911..	162	discharge measurements, 1911.....	287
Middle Creek at McKinnon's Rancho:		daily gauge height and discharge, 1911..	287
description.....	155	monthly discharge, 1911.....	288
discharge measurements, 1911.....	156	Moosejaw Creek (16. 26. W2):	
daily gauge height and discharge, 1911..	156	discharge measurements, 1911.....	289
monthly discharge, 1911.....	157	Moosejaw District (16. 26. W2):	
Middle Creek at Ross' Rancho:		summary of work.....	11
description.....	158	Moose Mountain Creek (3. 2. W2):	
discharge measurements, 1911..	158	discharge measurements, 1911.....	293
daily gauge height and discharge, 1911..	159	Morley Gauging Station:	
monthly discharge, 1911.....	160	(See Bow River).	
Milk River District:		Morrison Bros. Ditch (6. 21. W3):	
summary of work.....	11	description.....	207
Milk River Drainage Basin:		discharge measurements, 1911.....	207
general description.....	127	Mosquito Creek (16. 1. W5):	
Milk River, North Branch, near Peter's		discharge measurements, 1911.....	95
Rancho, Alta. (1. 23. W4):		Mosquito Creek (11. 10. W3):	
discharge measurements, 1911.....	127	discharge measurements, 1911.....	277
Milk River, North Branch, at Knight's			
Rancho, Alta. (2. 20. W4):		Mosquito Creek near Nanton, Alta.	
discharge measurements, 1911.....	128	(16. 28. W4):	
Milk River, North Branch, near Mackie's		description.....	91
Rancho (2. 8. W4):		discharge measurements, 1911.....	92
description.....	128	daily gauge height and discharge, 1911..	92
discharge measurements, 1911.....	128	monthly discharge, 1911.....	93
Milk River, South Branch, at Mackie's		Mountain Mill Gauging Station:	
Rancho, Alta. (1. 18. W4):		(See Canyon Creek; Mill Creek.)	
description.....	128	Mountain View Gauging Station:	
discharge measurements, 1911.....	129	(See Mami Creek):	
daily gauge height and discharge, 1911..	129	Muddypound Creek at Hart's Rancho	
monthly discharge, 1911.....	130	(11. 28. W4):	
Milk River at Milk River, Alta. (2. 16. W4):		discharge measurements, 1911.....	99
description.....	131	daily gauge height and discharge, 1911..	100
discharge measurements, 1911..	131	monthly discharge, 1911.....	101
daily gauge height and discharge, 1911..	132	Mule Creek at Erwin's Rancho (5. 1. W3):	
monthly discharge, 1911.....	133	description.....	207
Milk River at Writing-on-Stone Police De-		discharge measurements, 1911.....	207
tachment, Alta. (1. 13. W4)			
description.....	134		
discharge measurements, 1911.....	134		
daily gauge height and discharge, 1911..	135		
monthly discharge, 1911.....	136		
Milk River at Pendant d'Oreille Police De-			
tachment, Alta. (2. 8. W4):			
description.....	137		
discharge measurements, 1911.....	137		
daily gauge height and discharge, 1911..	138		
monthly discharge, 1911.....	138		
Milk River at Spencer's Lower Rancho, Alta.			
(1. 5. W4):			
description.....	140		
discharge measurements, 1911.....	140		
daily gauge height and discharge, 1911..	140		
monthly discharge, 1911.....	141		
conditions of runoff watershed.....	142		
Milk River near Mountain Mill (6. 1. W5):			
description.....	107		
discharge measurements, 1911.....	108		
mean daily gauge height in feet, 1911...	108		
Mineral Water Springs:			
temperature of springs, 1911.....	91		
Miner's Coulee (2. 11. W4):			
discharge measurements, 1911.....	148		
Mink Creek:			
discharge measurements, 1911.....	182		
Mitchell Creek (6. 2. W4):			
discharge measurements, 1911.....	165		
Monthly Mean:			
computations of.....	25		
Moorhead Ditch on Piapot Creek, Sask.			
(10. 22. W3):			
description.....	244		
discharge measurements, 1911.....	245		
daily gauge height and discharge, 1911..	245		
monthly discharge, 1911.....	244		
Moosejaw Creek Drainage Basin:			
general description.....	282		

N.

Namaka Gauging Station:	
(See Bow River).	
Nanton Gauging Station:	
(See Mosquito Creek; Nanton Creek.)	
Nanton Creek near Nanton, Alta.	
(16. 28. W4):	
description.....	93
discharge measurements, 1911.....	94
daily gauge height and discharge, 1911..	94
monthly discharge, 1911.....	95
Nash's Rancho Gauging Station:	
(See Battle Creek).	
Needham Bros'. Ditch, near Piapot, Sask.	
(11. 23. W3):	
description.....	242
Nez Percé Creek (8. 4. W5):	
discharge measurements, 1911.....	118
Nine Mile Coulee (7. 30. W3):	
discharge measurements, 1911.....	182
Nose Creek, near Calgary, Alta (24. 1. W5)	
description.....	66
discharge measurements, 1911.....	66
daily gauge height and discharge, 1911..	66
monthly discharge, 1911.....	67
Notukeu Creek:	
discharge measurements, 1911.....	277

O.

Office Work.....	17
Okotoks Gauging Station:	
(See Sheep River.)	
Oldman River Drainage Basin:	
General description.....	96

Oldman River, near MacLeod, Alta.
(9. 26. W4):

(9. 26. W4):	
description.....	103
discharge measurements, 1911.....	104
mean daily gauge height in feet, 1911 .	104
Oldman River, near Cowley (7. 1. W5):	
description.....	107
discharge measurements, 1911.....	110
Organization and Scope of Work	7
Oxarart Creek at Wylie's Rancho (6. 27. W3):	
description.....	183
discharge measurements, 1911.....	184
daily gauge height and discharge, 1911.	184
monthly discharge, 1911.....	185

p.

Pakowki Lake Drainage Basin:	
general description.....	144
Pekisko Creek at Pekisko, Alta. (17. 3. W5):	
description.....	77
discharge measurements, 1911.....	78
daily gauge height and discharge, 1911..	78
Pendant d'Oreille Gauging Station:	
(See Milk River.)	
Peter's Ranche Gauging Station:	
(See Milk River.)	
Piapot Creek at Cumberland's Ranche, Sask.	
(11. 24. W3):	
description.....	245
discharge measurements, 1911.....	246
daily gauge height and discharge, 1911..	246
monthly discharge, 1911.....	247
Piapot Creek (10. 24. W3):	
discharge measurements, 1911.....	248
Piapot Creek Gauging Stations:	
(See Needham Bros.' Ditch; Braniñ	
Ditch; Beveridge East Ditch; Bever-	
idge West Ditch, and Moorhead Ditch.)	
Pierce Creek (10. 24. W3):	
discharge measurements, 1911.....	277
Pincher Creek at Pincher Creek:	
description.....	105
discharge measurements, 1911.....	105
mean daily gauge height and discharge,	
1911.....	106
Pinto Creek (8. 6. W3):	
discharge measurements, 1911.....	277
Pipestone River near Laggan, Alta.:	
description.....	39
discharge measurements, 1911.....	40
daily gauge height and discharge, 1911..	40
monthly discharge.....	41
Police Creek (1. 9. W3):	
discharge measurements, 1911.....	279
Police Creek (1. 13. W4):	
discharge measurements, 1911.....	148
Pollock Ditch East at South Fork, Sask.	
(22. 7. W3):	
description.....	209
discharge measurements, 1911.....	209
Pollock Ditch West at South Fork, Sask.	
description.....	209
Pollock's Ranche Gauging Station:	
(See Swift Current Creek.)	
Poplar River Drainage Basin:	
general description.....	278
Poplar River:	
discharge measurements, 1911.....	279
Poplar River, East Branch:	
discharge measurements, 1911.....	279
Poplar River, West Branch:	
discharge measurements, 1911.....	279
Priddis Gauging Station:	
(See Fish Creek.)	
Pritchard Coulee (1. 11. W4):	
discharge measurements, 1911.....	148

Q.

Qu'Appelle River Drainage Basin: general description.....	270
Qu'Appelle River (19. 24. 2.): discharge measurements, 1911.....	282
Qu'Appelle River at Fort Qu'Appelle, Sask. (21. 13. W2): description.....	280

	Page.
discharge measurements, 1911.....	280
mean daily gauge height in feet, 1911.....	281
Qu'Appelle River at Katepwe, Sask. (19. 12. W2):	
description.....	281
discharge measurements, 1911.....	281
mean daily gauge height in feet, 1911.....	282
Qu'Appelle at Lumsden 19. 21. W2	
description.....	280
discharge measurements, 1911.....	280

R.

Rating Curves and Tables:	
computation of.....	24
Rating Station Current Meter.....	16
Read Creek (6. 3. W4):	
discharge measurements, 1911.....	165
Read's Rancho Gauging Station:	
(See Jones' Coulee.)	
Red Creek (1. 15. W4)	
discharge measurements, 1911.....	148
Red Deer River Drainage Basin:	
general description.....	31
Red Deer Gauging Station:	
(See Red Deer River).	
Red Deer River near Innisfail, Alta.	
(36. 28. W4):	
description.....	32
discharge measurements, 1911.....	32
Red Deer at Red Deer Alberta (38. 27. W4):	
description.....	32
discharge measurements, 1911.....	32
Red Deer River (Miscellaneous):	
discharge measurements, 1911.....	36
Ribstone Creek (43. 3. W4):	
discharge measurements, 1911.....	29
Rice Creek (1. 6. W3):	
discharge measurements, 1911.....	278
Richardson's Ditch near Kelvnhurst	
(5. 27. W3):	
description.....	178
discharge measurements, 1911.....	178
Robinson's Rancho Gauging Station:	
(See Ross Creek.)	
Rocky Creek Drainage Basin:	
general description.....	277
Rocky Creek (1. 6. W3):	
discharge measurements, 1911.....	278
Rocky Creek, West Branch (1. 7. W3):	
discharge measurements, 1911.....	278
Rolf Creek near Kimball, Alta.	
(2. 24. W4):	
description.....	126
Rose Creek at East End (7. 22. W3):	
description.....	197
discharge measurements, 1911.....	198
daily gauge height and discharge, 1911.....	198
monthly discharge, 1911.....	199
Ross Creek Drainage Basin:	
general description.....	269
Ross Creek at Robinson's Rancho, Alta.	
(9. 3. W4):	
description.....	269
discharge measurements, 1911.....	269
mean daily gauge height in feet, 1911.....	270
Ross' Creek at Irvine, Alta. (11. 2. W4):	
description.....	271
discharge measurements, 1911.....	271
daily gauge height and discharge, 1911.....	272
monthly discharge, 1911.....	273
Ross' Creek (9. 3. W4):	
discharge measurements, 1911.....	275
Ross Creek (8. 3. W4):	
discharge measurements, 1911.....	275
Ross Creek (12. 3. W4):	
discharge measurements, 1911.....	275
Ross Rancho Gauging Stations:	
(See Cow Creek; Middle Creek.)	
Runoff, Definition of.....	18
Runoff, Computation of.....	27
Runoff, per square mile:	
definition of.....	18
Runoff, in depth, in inches:	
definition of.....	18
Runoff Watershed of the Milk River:	
Study of conditions of.....	142

	Page.		Page.
S.		Sixmile Coulee at Spanglers' Rancho	
Sage Creek Drainage Basin:		(6. 29. W3):	
general description.....	151	description.....	167
Sage Creek at Wild Horse Police Detachment		discharge measurements, 1911.....	168
(1. 2. W4):		daily gauge height and discharge, 1911..	168
description.....	151	monthly discharge, 1911.....	169
mean daily gauge height in feet, 1911...	152	Skull Creek at Doyle's Rancho (10. 22. W3):	
St. Mary River Drainage Basin:		description.....	230
general description.....	122	discharge measurements, 1911.....	230
St. Mary River at Kimball, Alta.		daily gauge height and discharge, 1911..	231
(1. 25. W4):		monthly discharge, 1911.....	232
discharge measurements, 1911.....	123	Skull Creek Gauging Station:	
daily gauge height and discharge, 1911..	124	(See Bridge Creek; Skull Creek.)	
monthly discharge, 1911.....	125	Skull Creek near Skull Creek, Sask.	
St. Mary River at Whitney's Rancho, Alta.		(11. 22. W3):	
(7. 22. W4):		description.....	233
description.....	126	discharge measurements, 1911.....	234
discharge measurements, 1911.....	127	daily gauge height and discharge, 1911..	234
Saskatchewan River North Drainage Basin:		monthly discharge, 1911.....	235
general description.....	26	Slope, Method of Determining:	
Saskatchewan River North, at Battleford		discharge.....	19
(43. 16. W3):		Small's Rancho Gauging Station:	
description.....	27	(See Gap Creek; McShane Creek):	
discharge measurements, 1911.....	27	Snake Creek (16. 1. W5):	
Saskatchewan River North, at Edmonton		discharge measurements, 1911.....	95
(52. 24. W4):		Snake Creek (3. 13. W3):	
description.....	28	discharge measurements, 1911.....	208
discharge measurements, 1911.....	28	Sorrel Horse Creek (13. 30. W4):	
Saskatchewan River North, at Prince Albert,		discharge measurements, 1911.....	118
Sask.:		Souris River Drainage Basin:	
description.....	26	general description.....	289
discharge measurements, 1911.....	26	Souris River near Estevan (2. 8. W2):	
Saskatchewan River South Drainage Basin:		description.....	290
general description.....	29	discharge measurements, 1911.....	290
Saskatchewan River South, at Medicine Hat		mean daily gauge height, 1911.....	291
(12. 5. W4):		Souris River near Glen Ewen, Sask.	
description.....	30	(2. 1. W2):	
discharge measurements, 1911.....	31	description.....	291
Saskatchewan River South near Bow Island:		discharge measurements, 1911.....	291
discharge measurements, 1911.....	31	mean daily gauge height in feet.....	292
Saskatchewan River South, at Saskatoon		Souris River near Melita (4. 26. W1):	
(36. 5. W3):		description.....	292
description.....	29	discharge measurements, 1911.....	292
discharge measurements, 1911.....	30	mean daily gauge height, 1911.....	293
Schnieder's Rancho Gauging Station:		South Antler Creek (3. 32. W1):	
(See Mackay Creek, West Branch.)		discharge measurements, 1911.....	293
"Second Foot," Definition of.....	18	South Fork River near Cowley, Alta. (7. 1. W5):	
"Second Foot," per sq. mile:		description.....	106
definition of.....	18	discharge measurements, 1911.....	107
Seven Persons Drainage Basin:		mean daily gauge height in feet, 1911...	107
general description.....	275	Spangler's Ditch near Battle Creek (7. 28. W3):	
Seven Persons River at Medicine Hat, Alta.		(7. 28. W3):	
(12. 5. W4):		description.....	167
description.....	275	discharge measurements, 1911.....	167
discharge measurements, 1911.....	276	Spencer Creek (26. 5. W5):	
Sexton Creek (7. 3. W4):		discharge measurements, 1911.....	90
discharge measurements, 1911.....	165	Spray River near Banff, Alta. (25. 12. W5):	
Spring Creek (5. 2. W4):		description.....	44
discharge measurements, 1911.....	165	discharge measurements, 1911.....	44
Sheep River near Okotoks, Alta.		daily gauge height and discharge, 1911..	45
(20. 29. W4):		monthly discharge, 1911.....	46
description.....	75	Spring, A. (10. 25. W3):	
discharge measurements, 1911.....	76	discharge measurements, 1911.....	253
daily gauge height and discharge, 1911..	76	Spring, A. (10. 25. W3):	
monthly discharge, 1911.....	77	discharge measurements, 1911.....	253
Sheep River, North Branch at Millarville, Alta.		Spring, A. (13. 1. W5):	
(21. 3. W5):		discharge measurements, 1911.....	118
description.....	71	Spring, A. (13. 1. W5):	
discharge measurements, 1911.....	72	discharge measurements, 1911.....	118
daily gauge height in feet, 1911.....	72	Spring, A. (14. 1. W5):	
Sheep River, South Branch, near Black Dia-		discharge measurements, 1911.....	118
mond, Alta. (20. 2. W5):		Spring, A. (14. 1. W5):	
description.....	73	discharge measurements, 1911.....	118
discharge measurements, 1911.....	73	Starks & Burton Ditch near Woolchester, Alta.	
daily gauge height and discharge, 1911..	74	(11. 5. W4):	
monthly discharge, 1911.....	75	description.....	274
Single Point, Method:		Stimson Creek (17. 2. W5):	
determining mean velocity.....	22	discharge measurements, 1911.....	90
Six Mile Coulee (8. 29. W3):		Stimson Creek near Pekisko, Alta. (17. 2. W5):	
discharge measurements, 1911.....	182	description.....	78
Sixmile Creek (4. 4. W3):		discharge measurements, 1911.....	79
discharge measurements, 1911.....	277	daily gauge height and discharge, 1911..	79
Sixmile Coulee at Soderstron's Rancho		monthly discharge, 1911.....	80
(7. 28. W3):		Stirling's & Nash's Ditch near Kelvindhurst	
description.....	165	(3. 7. W3):	
discharge measurements, 1911.....	166	description.....	178
daily gauge height and discharge, 1911..	166	discharge measurements, 1911.....	179
monthly discharge, 1911.....	167	mean daily gauge height in feet, 1911...	179
		Stout Method of Interpolation.....	25
		Stream Flow, Methods of Measuring.....	19

U.

Page.

Gauging Station:
)

V.

Low	23
determining mean	22
curve method	22
od	22
od	22
od	22
determining discharge ..	21
ve Method of deter-	
Velocity	22

W.

on:	
ek; Maple Creek.)	
age Basin:	
on	119
ng Station:	
; Crooked River).	
terton Mills	
.....	119
.....	298
nining discharge	20
District:	
.....	11
11. 13. W3):	
ments, 1911	277
ress, Sask.:	
.....	256
Station:	
)	
W4.)	
ments, 1911	113
cleod, Alta.:	
.....	101
ments, 1911	102
and discharge, 1911 ..	102
, 1911	103
ng Station:	
k).	
t:	
.....	297
.....	23
);.	
ments, 1911	277
:	
ments, 1911	277
st:	
)	295
st:	
.....	13
ments, 1911	277

Y.

ments, 1911	119
-------------------	-----

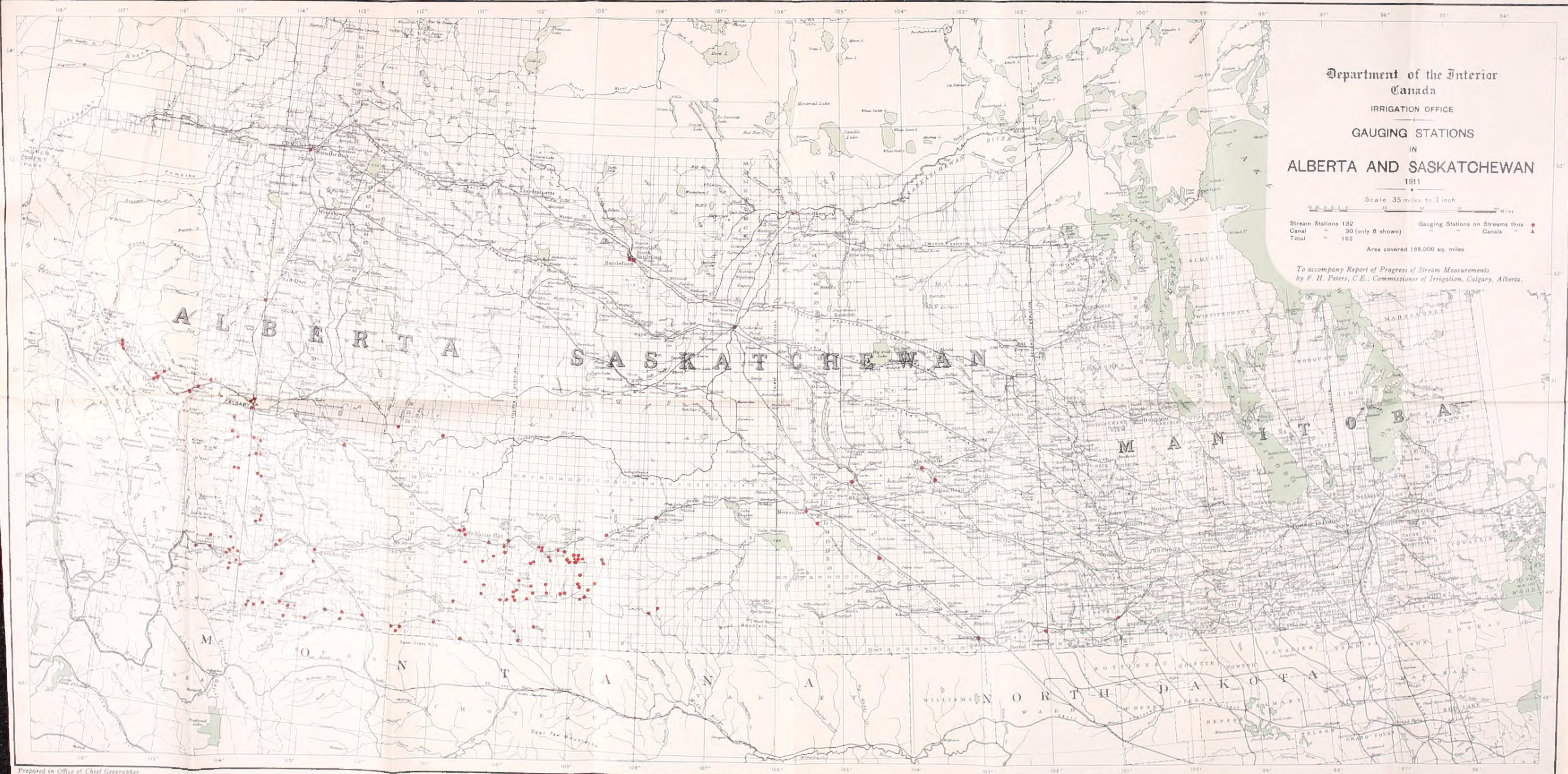
Department of the Interior
Canada
IRRIGATION OFFICE
GAUGING STATIONS
IN
ALBERTA AND SASKATCHEWAN
1911

Scale 35 miles to 1 inch

Stream Stations 132	Gauging Stations on Streams thus
Canal " 30 (only 8 shown)	Canals " A
Total " 162	

Area covered 166,000 sq. miles

To accompany Report of Progress of Stream Measurements
by F. H. Peters, C.E., Commissioner of Irrigation, Calgary, Alberta.



SESSIONAL PAPER No. 25d

Page.

Sucker Creek at Whitecombe and Ziegler's Ranche (6. 26. W3):	
description.....	185
discharge measurements, 1911.....	186
daily gauge height and discharge, 1911..	186
monthly discharge, 1911.....	187
Summit Creek (8. 6. W5):	
discharge measurements, 1911.....	118
Swift Current Creek Drainage Basin:	
general description.....	209
Swift Current Creek at Pollock's Ranche, Sask. (17. 21. W3):	
description.....	209
discharge measurements, 1911.....	210
daily gauge height and discharge, 1911..	210
monthly discharge, 1911.....	211
Swift Current Creek at Sinclair's Ranche, Sask. (Upper Station) (10. 19. W3):	
description.....	213
discharge measurements, 1911.....	214
daily gauge height and discharge, 1911..	214
monthly discharge, 1911.....	215
Swift Current Creek at Sinclair's Ranche, Sask. (Lower Station) (10. 19. W3):	
description.....	217
discharge measurements, 1911.....	218
daily gauge height and discharge, 1911..	218
monthly discharge, 1911.....	219
Swift Current Creek at Swift Current, Sask. (15. 13. W3):	
description.....	219
discharge measurements, 1911.....	219
daily gauge height and discharge, 1910..	220
daily gauge height and discharge, 1911..	221
monthly discharge, 1910-11.....	222

T.

Tables, Explanation and Use of:	
Taylorville Gauging Station:	
(See Rolph Creek):	
Tenmile Creek at Tenmile Police Detachment (6. 29. W3):	
description.....	170
discharge measurements, 1911.....	171
daily gauge height and discharge, 1911..	171
monthly discharge, 1911.....	172
Three Point Method of determining mean velocity.....	22
Two Point Method of determining mean velocity.....	22
Todd Creek at Elton's Ranche (8. 1. W5):	
description.....	110
discharge measurements, 1911.....	111
mean daily gauge height in feet, 1911...	111
Tongue Flag Creek (19. 28. W4):	
discharge measurements, 1911.....	90
Tothill's Farm Gauging Station:	
(See Grosventre Creek):	
Transmittal, Letters of.....	1
Trout Creek at Lockwood's Ranche:	
description.....	99
discharge measurements, 1911.....	99
Trout Creek at Stevenson's Farm (12. 28. W4):	
description.....	96
discharge measurements, 1911.....	97
daily gauge height and discharge, 1911..	97
monthly discharge, 1911.....	98

U.

Unsworth's Ranche Gauging Station:	
(See Bear Creek.)	

V.

Velocity Limitations, Low.....	23
Velocity, Methods of determining mean.....	22
Vertical velocity curve method.....	22
Three-point method.....	22
Two-point method.....	22
Integration method.....	22
Velocity, Method of determining discharge ..	21
Vertical Velocity, Curve Method of deter- mining Mean Velocity.....	22

W.

Walsh Gauging Station:	
(See Boxelder Creek; Maple Creek.)	
Waterton River Drainage Basin:	
general dewcription.....	119
Waterton Mills Gauging Station:	
(See Water River; Crooked River).	
Waterton River at Waterton Mills (2. 29. W4):	
description.....	119
Weir Adjuster:	
(G. H. White).....	298
Weir Method of determining discharge.....	20
Western Cypress Hills District:	
summary of work.....	11
Whiskey Creek, near (11. 13. W3):	
discharge measurements, 1911.....	277
White Ditch near Cypress, Sask.:	
description.....	256
Willow Creek Gauging Station:	
(See Lodge Creek.)	
Willow Creek (12. 23. W4.)	
discharge measurements, 1911.....	113
Willow Creek near Macleod, Alta.:	
description.....	101
discharge measurements, 1911.....	102
daily gauge height and discharge, 1911..	102
monthly discharge, 1911.....	103
Wilson's Ranche Gauging Station:	
(See Oxarart. Creek).	
Winter in Banff District:	
(V. A. Newhall).....	297
Winter Measurements.....	23
Wiwa Creek (12. 5. W3):	
discharge measurements, 1911.....	277
Wood Creek (4. 3. W3):	
discharge measurements, 1911.....	277
Wood Mountain District:	
(N. M. Sutherland).....	295
Wood Mountain District:	
Summary of work.....	13
Wood River (9. 4. W3.)	
discharge measurements, 1911.....	277

Y.

York Creek (7. 4. W5):	
discharge measurements, 1911.....	119

